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Report of the American Committee on Reinforced Concrete.

AT the annual meeting of the American Society of Civil Engineers in June, 1903, it was decided to form a special Committee to take up the question of concrete and reinforced concrete, the final result being the constitution of a body representing the Society of Civil Engineers, the Society for Testing Materials, the Railway Engineering and Maintenance of Way Association, and the Association of American Portland Cement Manufacturers.

The Joint Committee includes a goodly contingent of those engaged in engineering instruction, as shown by the names of Professor W. K. Hatt, Professor A. N. Talbot, Professor G. Lanza, Professor E. Marburg, Professor Swain, and Professor Turneaure; but it should be mentioned that most of these have devoted considerable attention to the scientific investigation of reinforced concrete. Professional engineers are well represented, among their ranks being Messrs. W. B. Fuller, R. L. Humphrey, Leon S. Moisseiff, J. W. Schaub, Sanford E. Thompson, and George S. Webster. The cement industry contributes several members, the best-known in this country being Messrs. R. W. Lesley and Spencer B. Newberry.

Unfortunately, as happened also in the case of the British Committee on Reinforced Concrete, there is no representation of engineers and others concerned in the practical construction of reinforced concrete works. Such an omission is undesirable for two reasons—one being that it may possibly lead to injustice, and the other that the knowledge and experience gained in practical work extending over a period of many years deserves to be brought before a Committee whose object is to collate knowledge and facts from every available source. Upon this point we may usefully cite the example of the French Ministry of Public Works, by whom some of the leading engineers commercially interested in reinforced concrete were appointed members of the *Commission du Ciment Armé*.

Although four members of the American Committee, including Mr. C. C. Schneider, the Chairman, and Mr. E. Swensson, the Vice-Chairman, dissent in some essential points from the views of the majority, and have expressed the opinion that the Report should not be published in its present form, their suggestion was not accepted, and the majority Report has been placed before the members of the several societies for the purpose of discussion.

In the following notes we deal first with the recommendations of the majority, making references to the Report of the British Committee where necessary or desirable.

Part II. of the American Report contains some timely hints on the improper use of reinforced concrete, pointing out defective design, poor or unsuitable material, and faulty execution as the usual causes of failures, from which we have so far been almost entirely free in the United Kingdom. Inadequate experience, lack of attention to the connexions between members, and the adoption of dangerously high unit-stresses are stated among other reasons for defective designs in the United States. The employment of inferior concrete and high-carbon steel of brittle quality are indicated as causes of failure coming under the category of those attributed to poor or unsuitable material. Faulty execution is another serious defect which could be eliminated by more adequate control over the work of contracting firms. The Report quite properly suggests that the responsibility of superintending the execution of all reinforced concrete works should be vested in the designing engineer, independent of the contractor. The recommendation is in accord with British practice and clearly deserves attention in America, where a different plan is frequently adopted.

Under the head of Responsibility and Supervision we notice the proposal that the test loads shall be such as to develop twice the calculated working-stresses in critical parts. The limit of test load to 50 per cent. in excess of the normal working load would be preferable, for it is important that unnecessary strain should never be imposed on newly executed work in concrete. The provision in the same clause that "load tests shall not be made until after sixty days of hardening" is wise, for the testing of concrete structures at too early a date as sometimes specified can serve no useful purpose, and may very easily lead to inconvenient results.

We believe it to be the fact that somewhat exhaustive tests have been conducted during the past three or four years by the American Committee. Hence one might expect to find in the Report a definite statement of the results ascertained. Nothing of the kind is put forward, although it may be assumed that the various recommendations made concerning the selection and employment of materials for concrete and reinforced concrete are in reality based upon the experiments undertaken.

The sections devoted to the durability of concrete and embedded steel, the constituents of concrete, the selection of metal for reinforcement, the preparation and placing of mortar and concrete, details of construction and general design are rather disappointing in the respect that they contain little or nothing that has not been known for the last ten years at least by practical constructors. The sections are satisfactory

considered as an authoritative confirmation of generally accepted knowledge and precepts, but it is a little open to question whether such a pronouncement represents an adequate return for any proportion of the 20,000*l.* supposed to have been expended in research work. Hostile critics of the Report urge with some show of reason that if, instead of constituting the Committee of men for the most part without personal experience in practical construction, the Joint Committee had included a sufficient leavening of men able to bring forward reliable data from past experience and to indicate forms of reinforced concrete design and problems awaiting inquiry, the labours of the organisation might have commenced at a less elementary stage, thereby enabling a better return to be made for the money dedicated to experimental research.

The consideration in point is one that may be commended to the organisers of future committees on reinforced concrete, and particularly to the Institution of Civil Engineers, by whom an inquiry is now being commenced on lines that are not suggestive of a satisfactory outcome.

The section in the American Report dealing with Destructive Agencies is rather feeble. For instance, we are told that "steel embedded in good concrete will not corrode," but that "if the concrete is porous the metal may be corroded in the presence of moisture." As to the effect of electrolysis on concrete, the Report says "there is little accurate information available."

Data concerning the effect of seawater on concrete and reinforced concrete are characterised as "inconclusive and limited in amount." Concrete of good quality thoroughly hardened is said to be affected appreciably "only by strong acids which seriously injure other materials," and to resist the action of "petroleum and ordinary engine oils," while oils "which contain fatty acids appear to produce injurious effects." The action of alkalies is characterised as problematical, a term which might be applied not inappropriately to indicate the practical bearing of the axioms in this section of the Report.

Part III., on Materials, rightly gives preference to Portland cement for reinforced concrete, and insists upon the adoption of the standard specifications for cement which are printed in Appendix I. to the Report. The remarks made on aggregates fairly represent the practice generally followed in good work, two points opportunely mentioned being the desirability—or, as we should prefer to say, the necessity—of seeing that aggregates are "free from vegetable loam or other deleterious matter," and the unsuitability of cinder for reinforced concrete structures, this type of aggregate being justly characterised as one that "may be safely used only in mass for very light loads or for fireproofing."

On the subject of "Metal Reinforcement" the Committee recommend mild steel complying with the specification of the American Railway Engineering and Maintenance of Way Association, printed in Appendix I., although for some reason which is not explained they publish an alternative specification, presumably their own, for high-carbon Bessemer steel with the tensile strength of about 47 tons per square inch. Material of this kind cannot be used economically as reinforcement, because the permissible stress must be governed by the ratio of the coefficients of elasticity and not by the tensile strength of the steel; moreover, it clearly comes under the ban stated in Part II. of the Report as a quality of steel likely to develop brittleness and thereby involve the risk of failure.

Part IV., on the Preparation and Placing of Mortar and Concrete, correctly outlines the procedure for securing good results, but leaves a good deal to the discretion of the operator. As in the British Report, it is assumed that the weight of Portland cement per unit of measurement may be taken as a constant for the purpose of determining the proportions of concrete, the fact being that the density of cement varies considerably in actual practice. To draw up satisfactory rules for the proportions of concrete is a difficult task, in the performance of which the co-operation of practical experts would be of much value.

The notes in Part VI. on Details of Construction contain nothing to which exception need be taken; they do not enter into details very much, and have a strong family likeness to the recommendations published in numerous textbooks and magazine articles during recent years. The thickness of concrete outside the metal in beams and floor slabs is the same as that in the British Report, namely, 1½ in. for beams and 1 in. for slabs, the latter being a dimension that could be safely reduced. We are in thorough accord with the recommendations that concrete should not be used in imitation of other structural materials, and that surface rendering should be avoided—at any rate, on the exterior of buildings. However carefully applied, an outer coat of plastering is always likely to crack and flake off under the action of temperature changes.

Coming next to the question of Design, considered under various headings in Part VII., we find a statement of general assumptions relating to loads and internal stresses. It is admitted that the hypothetical data are not entirely borne out by experimental results. They are, however, the same as those almost universally accepted as being practically correct, and at the same time essential as the basis of formulæ on the straight-line theory, which is that accepted by the British Committee and leading authorities on the Continent.

In beams and slabs provided with an adequate bond at the junction, and together constituting tee-beams, the slab width considered as the upper flange of the beam is not to be greater than "one-fourth of the span length of the beam," and its overhang on either side of the web "shall not exceed four times the thickness of the slab." These rules are somewhat more conservative than the tentative recommendations of the British Committee.

For the design of floor slabs the American Committee have nothing to suggest better than a formula identical with one of those in the British Report. This equation is admittedly without theoretical or experimental basis. There was justification for its adoption by the Royal Institute of British Architects' Committee, that body having had practically no facilities for independent research, but something better should be forthcoming from a Committee, representing four important American societies, after three years of investigation and the expenditure of a large sum in experimental work. There are so many buildings in the United States with floor slabs suited to practical tests which could have been effected at nominal cost that one may reasonably be surprised at the perpetuation of the unsatisfactory formula now in question.

In sect. 6 the Committee state the values $M = \frac{wl^2}{12}$ throughout the length of continuous floor slabs and interior continuous beams, the value $M = \frac{wl^2}{10}$ being recommended for the end spans of continuous beams. These equations are preferable to those of the British Committee, which do not contemplate a value lower than $\frac{wl^2}{12}$ even for beams with imperfect continuity, and give the optimistic designer justification for taking $M = \frac{wl^2}{24}$ at the middle of a span assumed by him to be perfectly continuous.

We must point out at this stage the serious defect that neither set of rules takes any notice of the upward bending caused by the unequal loading of adjacent spans in slabs and beams intended to be continuous. In the absence of reinforcement near the top surface throughout the length of such members there may be serious risk of failure in cases where one span is unloaded and the others on either side are fully loaded, because the concrete in the middle portion is there left to withstand severe tensile strain without reinforcement of any kind. The oversight is a serious blemish in the American Report, and once again shows the disadvantage of excluding practical men from the work of formulating rules for practical use.

The recommendations in sect. 8 relating to shear and diagonal tension seem to be based on the experiments of Professor Talbot, but as characterised by the Committee are merely "general and tentative." They are more conservative than those of the British Committee, and properly so, because the average shearing stress of 60 lb. per square inch permitted by the latter in the case of a beam without web reinforcement represents diagonal tension of undesirably high intensity although not involving any risk of failure by shear itself. We endorse the advice of the American Committee to the effect that the average shearing stress for beams with horizontal bars only should not exceed 40 lb. per square inch for concrete of the average quality denoted. This limit gives a factor of safety of from 3 to 4, according to the quality of the concrete, while the higher limit suggests 2 to 2¾ as the value of the factor.

Under the subheading "Columns," the American Committee give general rules governing the design of columns without justifying their procedure by references

to actual data. In one place they say that transverse reinforcement in a column "has little effect upon its behaviour within the limit of elasticity," and a little way beyond they advise, for columns having both longitudinal and transverse reinforcement, stresses 45 per cent. higher than those for longitudinal reinforcement alone. This advice seems to be reasonable, but we should very much like to know whether it is put forward as a plausible conjecture or as having any substantial foundation. Another recommendation in the same section is to the effect that columns with reinforcement of bands or hoops (but, as we read it, without longitudinal bars) may be subjected to stresses 20 per cent. higher than those in columns with longitudinal reinforcement. This is a proposal which cannot be accepted as reasonable, for it implies that the transverse reinforcement previously characterised as having little effect is actually more useful than longitudinal bars. The section as a whole is unsatisfactory, and should be replaced by a series of recommendations based upon and justified by experimental results.

Part VIII. deals briefly with Working Stresses, which for concrete are based upon the average compressive strength of 2,000 lb. per square inch when tested at the age of twenty-eight days. If the concrete is of lower strength the stresses are to be reduced proportionately, and if of superior quality they may be increased up to the limit 25 per cent. The Report assumes that the compressive strength of 2,000 lb. per square inch coincides generally with the proportions of one part Portland cement to six parts of sand and aggregate. The British Report bases working stresses upon the compressive strength of 2,400 to 3,000 lb. per square inch at twenty-eight days, which is a rather high estimate for the 1:2:4 concrete apparently but not positively stated to be implied.

Assuming the 25 per cent. increase admitted by the American recommendations to be taken advantage of in accordance with the equalisation of compressive strength to agree with the British figures, the stresses permitted by the two Reports compare as follows:—

COMPARISON OF THE PROPOSED AMERICAN AND BRITISH WORKING STRESSES.

(American stresses based on concrete of not less than 2,500 lb. per square inch compressive strength.)

Nature of Stress.	Am.Soc.C.E.	R.I.B.A.
COMPRESSION.		
Bearing of surface larger than the loaded area	812·5	500
Axial, on plain column or pier	562 5	500
Axial, on column with longitudinal bars	562·5	500
Axial, on column with bands or hoops only	652·5	500
Axial, on column with longitudinal bars and bands or hoops	815·6	500
Beams	812·5	600
Beams near supports of continuous	910·0	600
SHEAR AND DIAGONAL TENSION.		
Pure shear	150·0	60
Shear combined with equal compression	. . . *	60
Vertical shear as the measure of diagonal tension...	50·0	60
ADHESION.		
Between concrete and bars .	100·0	100
Between concrete and wire .	50 0	—
Reinforcement	160.0·0	15000-17000
Ratio of coefficients of elasticity (m)	15·0	15

* Half the compressive stress allowed.

In comparing the foregoing values we find that the ratio m is taken in each case at 15, and that the American stress for steel is not far different from that stated in the British Report. The latter is not very precise as to what is meant by shear. If the term is limited to vertical shear as the measure of diagonal tension, then the American limit is distinctly preferable, and for other forms of shear is in general accord with recent experimental results. The values for adhesion may also be accepted as satisfactory.

The main points of difference are in the values of the permissible compressive stresses for concrete in columns and beams. Taking the case of a column fully reinforced with longitudinal bars and transverse bands or hoops, the American Report proposes to allow far greater latitude than that contemplated by the British Committee, and an equally noticeable difference exists in respect of the compressive stresses in the concrete for beams.

We do not say that the proposed American stresses are too high for the best class of work where the general design and the disposition of the reinforcement are beyond question and where the concrete has been proved by actual tests to possess the compressive strength of not less than 2,500 lb. per square inch at the age of twenty-eight days, which is equivalent to about 3,500 lb. per square inch at six months. But for ordinary construction with concrete of the quality vaguely denoted by the proportions of 1:2:4 any increase of working stresses beyond those of the Royal Institute of British Architects' Report is clearly unwise. As already pointed out, the main defect of the American proposals is that no data are quoted in support of the recommendations made. This is a matter which, we trust, will be rectified before the Report of the Joint Committee is issued in final shape.

We quite approve the principle that the permissible stresses should be made dependent upon the proved qualities of the concrete, for in that way only can justice be done to those who employ the best materials with an ample proportion of cement, while at the same time those seeking to reduce the cost of concrete will be compelled to reduce the working stresses in like proportion. It is obvious, however, that if the principle were generally followed, its adoption must be accompanied by rigid tests, the importance of which is not sufficiently recognised at present in architectural practice.

In an appendix to the Report formulæ are given for rectangular beams, tee-beams, web reinforcement, and columns. The equations are virtually identical with those of the British Committee, but go a step farther by including the consideration of compression reinforcement in both rectangular and tee-beams, and by giving tentative rules for the design of web reinforcement.

When compared with the Report of the French *Commission du Ciment Armé* the document prepared by the American Joint Committee makes a very poor show. We generally endorse the opinion of the minority that the Report as presented is not "in proper shape for a document to be submitted to a society composed of engineers."

There is no statement of investigations conducted, and consequently the recommendations are not traced back to any definite basis. Many sections read more like the clauses of a specification such as an engineer might prepare for the guidance of contractors than like the Report of a scientific committee. The part relating to design is of limited character, and could have been written three or four years ago much as it stands without the aid of protracted and costly investigation. Moreover, inadequate attention is devoted to recent progress and experience, thus making the recommendations on design anything but satisfactory for modern engineering requirements.

It is probable that the Report will be somewhat severely criticised by members of the influential societies concerned in its production, and we trust that the final outcome will be a Report showing clearly the nature of the work done by the Committee, presenting a well-considered series of conclusions derived therefrom and a more carefully prepared set of recommendations. Like the recently abandoned code of building regulations proposed for New York, this Report furnishes one more illustration of the fact that American regulations must not be blindly accepted as models for imitation in this country.

LOCAL GOVERNMENT REPORT—UNEMPLOYMENT.

THE thirty-eighth Annual Report of the Local Government Board on the Poor Law, the Unemployed Workmen Act, and the Old Age Pensions Act contains some very interesting statistics. Turning to that portion of the Report which relates to the Unemployed Workmen Act, we find that the number of applicants for assistance in 1908-9 was more than double the number registered in 1907-8, viz., 196,757, as compared with 90,057. The Report says this increase may to a certain extent be accounted for by the formation of fourteen new areas, the removal of the disqualification of poor relief and employment on relief works in two successive years. However this may be, the number of applications represented a rate of 11·7 per 1,000 of the population, as compared with 6·0 per 1,000 in 1907-8, which discloses a very serious condition of employment, and it is significant that 17 per cent. of those found qualified for assistance after investigation were returned as belonging to the building trade. The reports of the various inspectors contain some very suggestive remarks, and more than one of the inspectors raises the question whether relief works, and labour-yards kept open by guardians, do not tend to increase rather than diminish the numbers out of regular employment. Thus, for example, although the depression in the building trade has affected Plymouth, Devonport, and East Stonehouse, the former town shows a slight decrease in pauperism, whilst there is an increase in the two latter towns, yet at Devonport,

where the operation of Distress Committees has been restricted and the guardians have not opened a labour-yard, the number of applications has not exceeded that of the previous year, whilst at Plymouth, besides a repetition of the applications of the previous year, there was an increase in new applicants. Doubtless such considerations apply with more force to casual than to skilled labour.

In view of the fact that unemployment appears likely to increase rather than decrease, and that relief works will be maintained for a third year in succession, this Report should be studied with care by those concerned with unemployment, and also by those interested in the proposed labour exchanges.

NOTES.

Oxford-street.

ALTHOUGH from Tottenham-court-road to High Holborn, New Oxford-street has been absolutely closed to traffic for nearly three weeks, it is stated that no complaints of inconvenience have been made to the Borough Engineer of Holborn, by whom the work of reconstruction is being conducted. Some people may think this absence of protestation due to the futility of objecting to a necessary evil, but we are inclined to believe that there has in reality been little inconvenience owing to the fact that for east and west traffic an excellent by-pass is provided on the south side by the combination of High Holborn, Broad-street, and High-street, while Great Russell-street on the north side affords ready means of access between Tottenham-court-road and the Clerkenwell district. The opinion has been expressed that the entire renewal of the concrete foundation for the new asphalt involves needless cost and trouble. The fact seems to be, however, that the frequent cutting of trenches by the Post-office, water, gas, and electric-light companies, and other authorities entitled by law to dig up streets at will, has impaired the stability of the foundation as a whole. In view of that consideration, it is to be hoped that ample provision is now being made for conduits of all kinds by means of subways, so as to obviate the necessity for another new foundation in the course of the next twenty or thirty years.

Street Lighting.

POSSIBLY the upshot of the recent visit paid by a deputation from the City Corporation to several continental cities may ultimately have the effect of modifying some of the vagaries now represented by the electric-light standards discussed in our article of last week. The immediate object of the visit was to inspect various systems of street-lighting adopted abroad, and from the Report published we learn that the Committee have arrived at the conclusion that wherever possible streets should be lighted by centrally hung lamps with lowering gear, while for open spaces lamps on standards with lowering gear are recommended. Thus for streets we have a fresh method suggested for the suspension of lamps and a modified form of standard for open spaces. If adopted, these proposals will furnish incentive for renewed effort on the part of designers, and it is to be hoped with more happy results than those hitherto attained. As for the means of illumination itself, the deputation appear to have been much impressed with the marked efficiency of high-pressure gas with inverted mantles. So well satisfied are the authorities of Berlin with that method of lighting that it will be used exclusively in the future. When employed in the open air the objections attaching to gas quite disappear, and until the cost of electricity is very materially reduced, that means of illumination will have to fight very hard against the latest developments of gas-lighting.

Casualties in Building Construction.

A PAPER read to the International Association for Testing Materials by Dr. Fritz von Emperger, of Vienna, deals with accidents due to unavoidable and preventable causes, to the latter category being added mishaps in which ignorance, thoughtlessness, and carelessness play a part. As an example of the serious extent to which casualties occur, the author cites the records of the workmen's union for steel bridge and building construction in the State of Illinois, where, out of a total membership of 1,350 men, no fewer than 102 casualties took place in 1905, and 156 in 1906. These figures are sufficient to suggest the enormous number of accidents to workmen which happen every year throughout the entire world as the result of building operations. In discussing preventable accidents on reinforced concrete buildings, Dr. Emperger points out that errors in the construction of moulds and centring have been largely responsible for the failures reported, although the defective construction of columns, inadequate designs, and inferior concrete cannot be absolved from blame. An opinion stated at the end of the paper is to the effect that every country endowed with a good code of regulations with reference to reinforced concrete work has been exempt from considerable disasters in such construction. Although this view may seem unassailable, it is curiously at variance with the facts that in Great Britain, where no official rules exist for the control of building in reinforced concrete, there have been no serious failures, and that America and various Continental countries with regulations of the kind have so far held a virtual monopoly in reinforced concrete mishaps.

The Philadelphia Building Collapse.

BY the collapse of a building last month in Philadelphia seven workmen were killed, two others seriously injured, and twenty-five workmen and foot passengers more or less seriously hurt. The structure was a five-story brick and timber-framed building, and at the time of the accident was in course of reconstruction. From a report by the chief of the Bureau of Building Inspection we gather that the occurrence may have been due to one of four causes:—(1) The displacement of one of the shores by a steel girder which was being slung into the building just before the collapse; (2) the attachment of tackle to sills or the shoring to hoist this girder; (3) the removal of shoring to permit the girder to pass; and (4) the collapse of the fourth floor under the loading transmitted by tackle attached there for handling the same girder. The last of these theories is the most probable, since the floor in question was admittedly very weak and the tackle had been placed at the weakest point on the floor. Subsequent investigation by a coroner's jury led to the conclusion that the collapse was due to "the pulling out of joists, by vibration, due to concealed defects." This finding exonerates the contractors from blame, but is not very lucid as an explanation of the cause. The evidence brought forward showed the building to have been far more unstable than appeared from external examination, and suggested that the work of reconstruction was a very hazardous proceeding, although the risks were certainly not appreciated at the time when operations were started. It is really a very delicate and risky business to interfere with old buildings, and no such work should be undertaken until the most careful investigation has been made.

Effect of the Galveston Sea Wall.

IN our article of October 14, 1905, a detailed account was given of the great sea wall constructed to protect the city from a repetition of the destruction caused by the hurricane of 1900. Last month a very similar storm swept along the southern coast of Texas, killing twenty-three people and causing much damage to property. Proceeding from the Gulf of Mexico, the hurricane drove the waters of Galveston Bay against the new sea wall. Some of the waves washed over the crest and a portion of the city was flooded, but thanks to the protection offered and the levelling-up process which has been effected in the area behind, the result was merely inconvenience, instead of the wholesale devastation that would have been caused under the old order of things. Thus the important engineering work to which we refer has amply justified the anticipations of the designers, and the large population attracted by Galveston Harbour must feel renewed confidence in the defences of the sand spit upon which their city is built.

Queen-square, W.C., and Lamb's Conduits.

IT is believed that the tank or well-head in the garden of No. 20, Queen-square, to which attention has been directed by the sale of the property a few days since, appertains to the water supply of Grey Friars, Newgate-street. In later times Christ Hospital, on that site, continued to derive its supply from springs and conduits in the south-eastern parts of Bloomsbury—for instance, in Red Lion-fields, in the fields now traversed by Bedford-place, Russell-square, and in and near Lamb's Conduit-street. Fifty years ago there were in the garden of No. 30, East-street a pump and a spring, with an inscribed stone stating that it was "the head of the spring Lamb's Conduit Water." In 1577 William Lamb, citizen and clothworker, rebuilt the conduit (1497) on Snow-hill, and laid new pipes thence, at his own charges, to a conduit just beyond Great Ormond-

street, which bore his name and subsequently gave a name to Lamb's Conduit-street. After the building of the Foundling Hospital that well-head was shifted (1746) to the yard of the adjacent "Lamb" public-house, where, in 1851, J. W. Archer found beneath the pavement a short flight of steps, a bricked vault, and the covered well; his drawings of the remains in Long-yard and East-street are in the British Museum. On the gable-end of a house in Long-yard is, or was until lately, indication of a bricked-up recess with an inscription carved in the lintel, "Lamb's Conduit; the property of the City of London. . . ." Lamb's two conduits were rebuilt in 1677 from designs attributed to Wren.

Forest Fires Again.

ONCE more widespread conflagrations have broken out in the pine forests of British Columbia. Timber to the value of many hundreds of thousands of pounds has been consumed, in addition to numerous lumber mills. The serious nature of the situation will be realised when we state that according to latest reports two towns were threatened by an advancing wall of flame at least a mile wide; that Fernie, burnt up and rebuilt last year, is again surrounded by fires; that the forests about Creston are blazing fiercely, having driven the inhabitants to seek refuge elsewhere, that the woods on the side of Arrow lake are rapidly being destroyed, and that bridges on the Canadian Pacific and the Great Northern railways have been burned wholesale. The task of fighting extensive fires when fairly started is almost hopeless in dry weather such as now prevails in Canada. The worst of these outbreaks is that in a few hours the growth of many years is literally wiped out, involving heavy pecuniary losses and leaving wide gaps in the timber resources of the country.

The Abbey Pulpit at Shrewsbury.

THERE is visible at Shrewsbury so much appreciation of the value of architectural remains of the past that it is surprising that some measures have not been taken to remove the fine stone pulpit which now stands in a builder's yard opposite the Abbey Church into the precincts of that building. Probably for the time being this interesting mediæval relic is safe enough, but its position in the middle of bricks and drainpipes is very incongruous and even unseemly. All round the Abbey Church there is ample space, and the time seems to have come when an effort should be made to vest the property in this pulpit in some public body and safeguard it for all time. Here is another useful task for that invaluable body the National Trust, if local energy cannot accomplish it.

COUNCIL SCHOOL, SELLY OAK.—The infants' and girls' departments of the new school erected in Raddle Barn-lane, Selly Oak, by the King's Norton and Northfield Urban District Council, has been opened. The school has been built in three blocks, and has accommodation for 1,200 children, each block holding 400, and in addition there is a centre for the teaching of cookery and laundry work. Each department consists of a central hall, seven classrooms, two teachers' rooms, and the usual storerooms. The cost per head is 10*l.* 15s. The architect was Mr. J. P. Osborne, Birmingham, and Mr. Johnson, Birmingham, executed the work.

COMPETITION FOR EXTENSION TO STOKE TOWN HALL.

STOKE-UPON-TRENT, which is generally looked upon by the public as the capital of the Potteries, though in reality Hanley is the largest town, possesses a Town Hall of some considerable size, containing the municipal offices on the ground floor and a large assembly-room on the first. It is situated in Glebe-street facing the open space which surrounds the parish church, and it is bounded on either side by two streets, Tower-street and Aqueduct-street, which lead down to a canal forming the fourth boundary of the plat. The Town Hall, which is a shallow building, only fills a small portion of this site, showing short end features to Tower-street and Aqueduct-street, and it is proposed to continue the frontages on either side, filling in the space between the Town Hall and the canal with new buildings. The main requirements for this competition were very similar to those at Burslem, that is to say, a large concert hall, a small hall, and a court-room; there was to be in addition a banqueting-room on the first floor placed in direct communication with the existing assembly-room on the front of the old building. It will be then seen that the present competition has no connexion with the proposed scheme of federation, as there are to be no additions to the municipal offices proper, which remain quite adequate for a town of the size of Stoke.

The existing Town Hall is a Greek revival building with an arcaded ground story (which was originally an open market) and an upper story treated with antæ pilasters and with an Ionic portico over the main entrance in the centre of the Glebe-street front.

Mr. Leonard Stokes was the assessor, and he has placed first the design submitted by Messrs. Garratt & Simister (Birmingham); second, Messrs. Warwick & Hall (London); and third, Mr. W. Heywood (Birmingham). In the conditions issued there was one flaw which will probably lead to considerable unpleasantness, and has already led the committee appointed to look after the competition to refuse to endorse the assessor's award. The clause was as to the cost of the building. It was to cost 30,000*l.*, and in place of the usual 10 per cent. or 5 per cent. margin, it was vaguely mentioned that any design that "materially exceeded" this amount would be disqualified. It was left to the discretion of the committee as to what "materially" meant—to a cabman 6d. is a material difference, but in a building of this size 2,000*l.* is a small matter. Mr. Stokes, in his report, pointed out that he did not think that any of the designs could be carried out for the money, and with this we agree; considering that the building was only to cost 5,000*l.* more than the Burslem one, one can hardly expect that it would provide accommodation for 1,000 more in the large hall, also a banqueting hall and four additional committee-rooms. The committee, however, having obtained estimates of some sort, have adopted the course of disqualifying the first and third premiums and awarding the second premium to the second, without definitely saying whether Messrs. Warwick & Hall will be entrusted to carry out the work. The second is certainly a more economical plan, but the whole affair is most unsatisfactory.

As regards the general disposition of rooms, the three premiated designs and many others, including those submitted by Mr. Hare and Messrs. Russell & Cooper, agree pretty closely. The large hall is placed at the back of the site towards the canal, its axis parallel to the old building. The space in between is cut into equal halves by a corridor leading from the main entrance of the old building to the centre of the side of the great hall. On one side of this corridor are placed the small hall with its committee-rooms, on the other the court with its various dependencies. The banqueting-room is placed on the first floor on the other side of the existing staircase hall, which would have to be crossed in order to walk from the existing assembly-room to the banqueting-rooms. This arrangement allows each separate division to be approached from the main entrance of the old building, and also separately from the two side streets. Perhaps Messrs. Warwick & Hall's plan, which we illustrate this week, *is* the simpler and more direct of those placed first and second. On to Tower-street, the more important of the two, open the small hall and the great hall; the court on to Aqueduct-street; at the four corners of the court and small hall are grouped the committee-rooms, and two are on the first floor, served by the stairs leading to the small hall gallery; there are four moderate sized areas. The elevations are naturally irregular. We feel it far fetched to attempt, as Messrs. Lanchester & Rickards and Mr. Hare have done, a symmetrical elevation to Tower-street by dint of making the hall behind a small, narrow feature, in reproduction of the end of the old Town Hall.

Messrs. Garratt & Simister place the small assembly hall on the Aqueduct-street side, but they show no entrance from this street, and it is therefore only possible to enter it from the old building, which is a drawback. We prefer the other disposition, with the court entered from Aqueduct-street and both halls from Tower-street. Again, considering that money was a great consideration, far too many small rooms are added to the court block—double witness-rooms, barristers' and solictors' separate, and a juryroom, all in addition to the spare rooms asked for. The elevations are rather better in detail than Messrs. Warwick & Hall's, but four features, two large and two slightly smaller, are too many for this short front (in addition to the existing end of the Town Hall), and produce a bad composition.

Mr. Heywood's scheme resembles No. 2 in general plan, and No. 1 in grouping on elevation; but we could not see that he had provided the four spare committee-rooms asked for. This omission greatly simplified the problem.

Messrs. Lanchester & Rickards, while adopting the same general disposition, of parts, made their hall semi-circular, with the centre of its arc not facing the main entrance in the side street, but down the long corridor into the old building. Both side streets have an entrance into the hall, but that from Aqueduct-street would be only useful as an emergency exit. The hall would then be normally entered at the extreme corner of its arc. But worse is the effect of the elevation to Tower-street—the only elevation worth accentuating. The end feature of the old building is exactly repeated, but behind this comes the unwieldy cut-off end of the great hemi-cycle with a cupola poised on its truncated side. The elevation to the canal, where the whole of the hemi-cycle is marked by a parapet wall and the cupola appears on the top of the stage apse, is the only piece of design that recalls the authors of the great Methodist Hall.

Perhaps from the point of view of elevational treatment, Mr. J. B. Fulton's design is the most satisfactory. His plan is almost identical with the one he submitted for Burslem. The large hall lies along the Tower-street side, and the court and small hall are placed side by side on to Aqueduct-street. This latter arrangement is not good, and the main central corridor has to be joggled to one side in order to obtain the necessary width for the large hall. But the effect to Tower-street, with continuous crush space, cloak-rooms, etc., on the ground floor and an open colonnade above carrying on the cornice and pilaster order of the old building, and making the addition one simple block instead of various, odd-shaped masses, is unmistakably fine.

Messrs. Russell & Cooper's design was far inferior, both on plan and elevation, to their Burslem design, illustrated in our last issue.

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There were eighty schemes sent in for this competition, and they have been on view in the Stoke Town Hall during the present week.

REINFORCED CONCRETE IN ALDWYCH: GENERAL ACCIDENT ASSURANCE BUILDING.

THE new office building of the General Accident Assurance Corporation will occupy an irregular site measuring about 126 ft. deep, with a frontage of about 112 ft. at the eastern end of Aldwych. It will be a steel frame building with self-sustaining masonry walls and fire-resisting floors, some of reinforced concrete, and some of terra-cotta tubular blocks carried on steel joists. The foundations for the entire structure are of reinforced concrete, and so also are two retaining walls, one along the street front, and the other extending for part of the way across the back of the site.

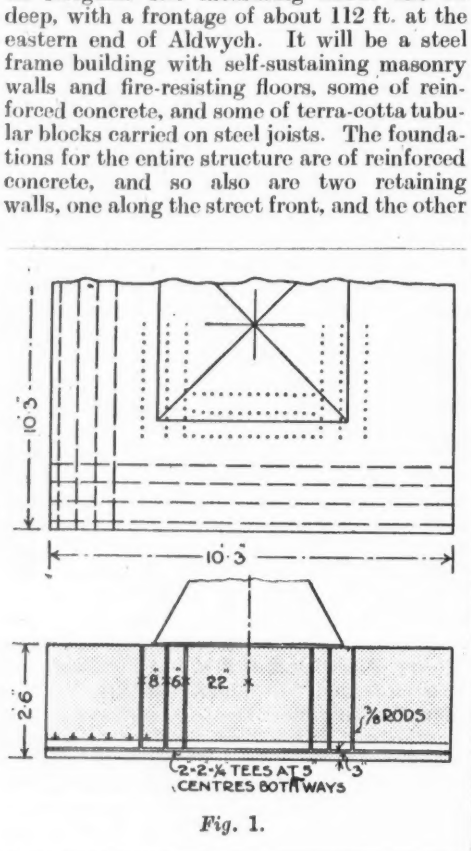

Fig. 1.

In this article we confine attention to the reinforced concrete work, which is being executed by the British Fireproof Construction Company, but it should be stated that the steel framework is also in the hands of the same firm. The architect is Mr. John J. Burnet, A.R.S.A.

All the column foundations are of reinforced concrete, so also are the foundations for the western main wall, while the whole interior area between the main walls and around the column foundations is covered by a raft of reinforced concrete. Although the raft is continuous in every direction it comprises four bands crossing the site from side to side, these bands including nearly all the column foundations, and virtually constituting beams with the minimum thickness of 18 in. Between them the slabs are 16 in. thick. The reinforcement for the raft consists of small T-bars ranging in dimensions from $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by $\frac{1}{4}$ in. to 2 in. by 2 in. by $\frac{1}{4}$ in.

Fig. 1 shows a typical column foundation in plan and section. This foundation is designed for the load of 284 tons, the dimensions of the other foundations varying in accordance with the loads to be supported. The reinforcement consists of T-bars, with the addition of $\frac{3}{8}$-in. diameter vertical rods spaced as indicated on the plan.

The foundation for the west wall is illustrated by Fig. 2, wherein one section carries the wall alone and the other provides for the support of a column in addition. On the occasion of our visit to the works, the foundations were complete, including the formation of lift wells and various ducts in the basement floor. The area of the raft is nearly 1,000 sq. yds., and we were informed that the time occupied in the construction of all the foundations was only twenty-one working days. We may add that the present is a favourable time for architects to inspect the work, as a very good bird's-eye view of it can be obtained from the elevated staging along the front.

Details of the front retaining wall, the construction of which is now being started, are given in Fig. 3. In this case the reinforcement is in the form of ordinary round bars, disposed in the customary manner. It will be observed that the inner flange of the foundation is extended to meet the general foundation raft, and that the top of the wall is connected with members of the steel framework by rolled steel joists, over which is constructed a continuous decking of reinforced concrete.

Some of the floor panels will be filled in by slabs formed of 1: 6 boiler ash concrete reinforced by 1 in. by 1 in. by $\frac{1}{8}$ in. T-bars spaced 6 in. apart, the bars being curved upwards and bent over the supporting girders as illustrated in Fig. 4. The weight of the reinforced concrete floor slabs is 48 lb. per square foot for the thickness of $6\frac{1}{2}$ in., and 62 lb. per square foot for the thickness of $8\frac{1}{2}$ in., these weights and measurements being inclusive of a $1\frac{1}{2}$-in. finishing layer in each case.

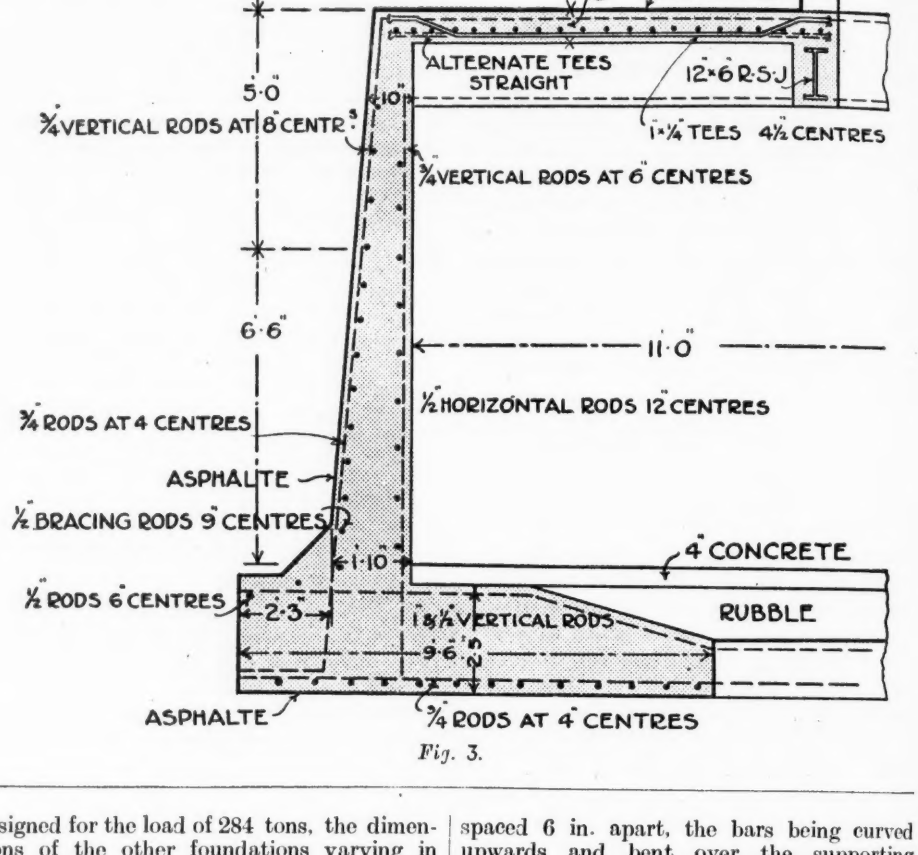

Fig. 3.

Fig. 4.

Other floor panels in the building will be formed of light joists carrying hollow terra-cotta tubes by which the lower flange of every joist is adequately protected. As shown in Fig. 5, the tubes are covered by a filling of 1: 6 boiler ash concrete, and the floor is completed by a finishing coat of concrete.

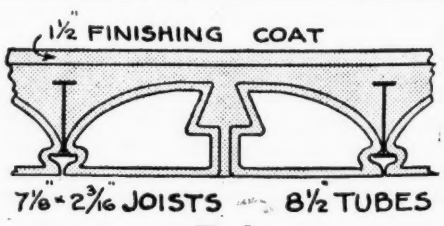

Fig. 5.

The works here described constitute an interesting application of reinforced concrete in connexion with ordinary building construction, and show that the rival claims of steel and the newer material are not invariably of conflicting nature.

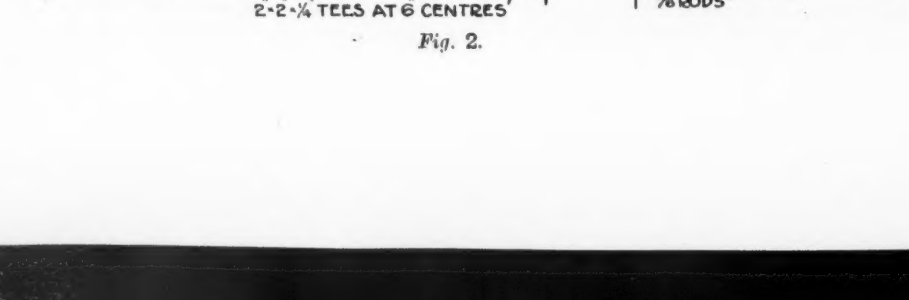

Fig. 2.

BATHS EXTENSION, ALTRINCHAM. — The Altrincham District Council have now completed the extension, at a cost of about 4,000*l.*, of the Stamford New-road Baths. The original baths were opened in 1901, and a new plunge and eight private baths have been added. The extension was designed by Mr. P. D. Lodge, architect, of Manchester.

PUBLIC BUILDINGS AT BURSLEM.

AN open competition for new public buildings has been held at Burslem, one of the federated towns in the Potteries. These buildings are not to provide municipal offices, though the present housing of certain departments would suggest that they are wanted; nothing, however, we imagine, will be done in that direction until federation takes place next March; but they are to fulfil a three-fold object—a large municipal theatre or concert hall, an assembly-room, and a series of court-rooms. There is already a Town Hall at Burslem, an old classical building with offices on the ground floor and a hall above—what precisely these will be used for with the new concert hall as proposed in this competition, and the new federated offices at some central town, remains to be seen. The old building is rather a fine block, consisting of a restricted and battered basement and a single order of Corinthian pilasters above, without attic; the worst feature is a tower at the far end, of ragged outline. The site for the new building is near the Town Hall on the other side of Wedgewood-place, on to which the end of the Town Hall without the tower looks; but, instead of having an uninterrupted view of each other, these two public buildings are separated by a Police Station and Market Hall, which jut out into Wedgewood-place, and cut off half of the front of the proposed building from the Place.

The Police Station is negligible, but the Market Hall is an old Greek Doric building of some interest but inferior detail; the actual market is held under cover on the opposite side of the market place. It would therefore seem quite probable that at some future date it might be decided to sweep away these two buildings and leave an unbroken view of this new building from Wedgewood-place, facing the Town Hall. This point, which was not raised in the conditions, had an undoubted effect upon the general treatment of the building. The large hall, the assembly-room, and the courts were the three items to be dealt with; the two latter were of about equal height, and the large hall the preponderating mass. If the Market Hall and Police Station were to be removed it would be natural to treat the building as a single whole, with the hall manifest in the middle and the assembly-room and courts balancing at either side. But if the Police Station and Market Hall are to remain, this symmetrical arrangement would immediately become futile, as a fragment of a one-story building alone would be visible from Wedgewood-place. The site was otherwise an easy one to treat, as it was bounded, besides the Place, on two other sides by streets, and on the fourth it adjoined the Post Office, from which it might be separated by an area.

The conditions were admirably general in tone, giving an idea of the requirements wanted, but not stipulating actual areas, and leaving materials and design absolutely to the discretion of the competitors. The remuneration clauses were particularly fair and clear, giving 1¼ per cent. to the first premiated in case the work was not proceeded with in the course of the next five years, and 100*l*. and 50*l*. respectively to the second and third premiums. The plans were wisely allowed to be drawn to $\frac{1}{10}$-in. scale, but the elevations were restricted to $\frac{1}{8}$-in.; not so wise was the prohibition of any shaded drawings, as classical architecture makes but a poor show in thick black lines only.

The actual requirements included a concert hall to seat (with galleries) 2,000, with a stage; an assembly-room to seat 400; two court-rooms, one for police and the other for a borough court, and a smaller room for a children's court, with one suite of magistrates', solicitors', and other retiring-rooms to serve all three courts; finally there was to be kitchens, etc., conveniently situated for the assembly-room, which would be used on occasion for banquets.

The assessor appointed by the Institute of Architects was Mr. H. T. Hare, and out of the twenty-three sets submitted he awarded first premium to Messrs. Russell & Cooper, second to Mr. E. M. Thomas, and third to Messrs. Warwick & Hall.

The first and second were very similar in general arrangement; Messrs. Russell & Cooper, whose design we published in our last issue, placed the central hall in the middle, with its main axis at right angles to Wedgewood-place, flanked on the left by the assembly-room and on the right by the courts; outside these again there were lower buildings, encircling, and containing cloak-rooms on either side of the entrance to Wedgewood-place, and various retiring-rooms, etc., on the sides. The object of the whole building is apparent from the outside—the central hall faced by an Ionic portico in antis and standing up clean above the other buildings; the smaller assembly-room and courts evident on either side above the lower corridor and service-rooms. Advantage was taken of the slope of Wedgewood-place towards the Post Office to gain greater height for the court-room, and a mezzanine floor for the magistrates' room, which are placed under the ladies' cloak-room, which balances the gentlemen's cloak-room on the left of the entrance. The treatment of the front to Wedgewood-place is Greek in detail, and would harmonise well with the Town Hall if the two buildings could be seen at once. This design has shown the wisdom of leaving the architect a free hand as to his choice of style and allowing him to be governed by the only real restriction—the requirements of the actual position in relation to its surroundings. The drawings of this set are not striking, and a poor perspective by no means does justice to the proportion of the front.

Mr. E. M. Thomas's scheme, which we illustrate this week, as we have already remarked is similar on plan to the first, but he has put a great deal more detail into the law courts' section, which seems to us rather needlessly broken up into small parts.

Messrs. Warwick & Hall have placed their main hall to one side of the site, and we suppose, in order to make the best show possible, have put it at the upper end, looking into Wedgewood-place, whereas the law courts, being on the lower ground, appear doubly low in consequence. The result entirely depends on the permanent retention of the Police Station and Old Market Hall. Their main entrance to the hall is not from the end, but the side towards Jenkins-street, which is not so good; but they have certainly provided a more ample court space than Messrs. Russell & Cooper, whose plan is deficient in this respect. The vast bulk of the hall on to Jenkins-street gives too much importance to the elevation, which might have been simplified without any loss.

Mr. J. B. Fulton rather threw away the value of his big hall by placing it at the far side of Wedgewood-place and parallel to it, thus showing a low range of buildings along the front crowned by a low and rather ugly dome over the entrance vestibule, which separated the courts from the assembly-hall.

Messrs. Mackintosh & Neumann adopted yet another arrangement by placing the central hall in the middle of the site, parallel to Wedgewood-place, with courts in front and assembly-room behind. Their main elevation is thus given to Jenkins-street, which is misplaced; and the front to the Place is confused and wandering.

There are several designs by local architects not calling for special mention, and we understand that one or two other schemes were disqualified for infringing upon the conditions in using traces of wash on certain drawings.

HOUSE AND STUDIO, COBHAM.—Plans for the erection of a new house and studio at the corner of Anyards and Freelands roads, Cobham, for Mr. Hugh West, photographer, of Cobham, Surrey, have been approved by the Epsom Rural District Council. Mr. Drinkwater Butt is the architect.

NOTES FROM PARIS.

IT is announced that the Colonial Office will be definitely removed from the Louvre in October, and that the Pavillon de Flore, which it has occupied for so long, will be at last available for the enlargement of the Museum. It is proposed to arrange here the collection of pictures and other works of art left by MM. Chauchard and Thomy-Thierry, as also that given by M. Moreau-Nélaton, the sculptor. Sculpture, ceramic work, and applied art will be placed on the ground floor. On the first floor, on the side next the river, a long gallery will be reserved for large pictures, and on the side next the Carrousel a series of small galleries will be formed for cabinet pictures and other small objects. The second story is to be reserved for other works that may in future be presented to the Louvre.

According to a decision of the Municipal Council of Paris, a large subterranean hall is to be formed under the Place du Hâvre, in front of the courtyard of the St. Lazare railway terminus. This will contain shops and booking-offices in connexion with the different State railways and the Metropolitan railway.

In the new buildings for the Bibliothèque Nationale, built along the Rue Vivienne from the designs of M. Pascal, the old "Cabinet du Roy" is to be reconstructed, with its woodwork, its ceiling, and its original Louis Quinze furniture.

The four large decorative pictures by M. Besnard, painted for the central dome of the Petit Palais, are to be put in position next month.

The Académie des Beaux-Arts has awarded the annual Jean Leclaire prize, this year, to M. Henri Expert, pupil in the First Class in Architecture at the Ecole des Beaux-Arts.

THE HYDRATION AND HARDENING OF PORTLAND CEMENT.

M. PAUL ROHLAND has during the past few years contributed largely to the chemistry and technology of this subject, and the following is a digest of the conclusions he has reached and published to the present time. Hydration reactions, whether organic or inorganic, take place spontaneously, and their velocity is very much affected by small quantities of foreign matter and by temperature. Hardening does not always accompany hydration—quicklime, for instance, falls to powder; it is, therefore, due to some special circumstance. He believes that a solid solution is formed in all cases where hardening accompanies hydration. The hastening or slowing of hydration, whether of gypsum or of Portland cement, by salts he views as a result of a change of the solubility of the solid substance which is undergoing hydration. The substance undergoing hydration must first pass into solution before hydration takes place. Sodium carbonate and aluminium salts increase the rate of hydration; moreover, the increase produced by pairs of salts, such as sodium carbonate and aluminium chloride, acting together is considerably greater than would be expected from a summation of their individual effects. On the other hand, when two salts, such as bichromate of potash and borax, each of which taken alone produces a retarding influence, are allowed to act together the retardation is less than can be accounted for by adding together the effects due to each one separately.

These fundamentals Rohland has used to explain the action of acid, alkaline, and fermenting liquors on Portland cement. The surface layer of hardened Portland cement consists chiefly of calcium hydroxide, coagulated silicic acid, and aluminium hydroxide, crystallised calcium hydroxide, and calcium carbonate formed from the last. It is to be expected that the rapidity with which solutions attack Portland cement should vary according to the concentration of hydrogenions

in such solutions, or, in other words, in proportion to their acidity. Strong mineral acids which form soluble calcium salts readily act on Portland cement; in the case of acids which form insoluble calcium salts, such as sulphuric, sulphurous (which readily oxidises), and hydrofluoric acids, the cement becomes covered with a protecting coat.

Acetic acid attacks Portland cement considerably. The presence of organic substances retards the action of strong acids on Portland cement very materially. Solutions containing hydroxylions—in other words, alkalies, as contrasted with the acids hitherto referred to—have no effect on hardened cement, and exert a favourable effect on cement which is in the process of setting. In the presence of water the calcium silicate and aluminate in the cement are hydrolysed to calcium hydroxide, and colloidal silicic acid and alumina; owing probably to increase of hydroxylions the silicic acid and alumina become coagulated, thereby protecting the cement from further action. By addition of alkali (potash, soda, lime) the concentration of the hydroxylions is increased, the hydrolysis of the calcium compounds in the cement being thus diminished. Salts that are hydrolysed by water have an unfavourable action on cement if they consist of a strong acid and a weak base; if they consist of a weak acid and a strong base they exert a favourable influence at the beginning of the setting process, and subsequently have no effect. Alkali carbonates belong to the latter class, and present a special advantage in that they form a protecting layer of calcium carbonate.

Non-hydrolysable salts, provided that they do not react with the ingredients of the cement, have no effect on hardened cement, *e.g.*, chlorides and sulphates of sodium and potassium.

Organic liquids which contain neither hydrogen nor hydroxylions, such as shale and mineral oils, have no action on hardened cement; it must be remembered, however, that such liquids may become acid by oxidation. Oils containing fatty acids are, of course, injurious, although it has been observed that rich cement mortar—one to one—especially when it becomes covered with calcium carbonate through hardening in the air, is very resistant to these liquids. With regard to wine musts, the organic acids present are so slightly dissociated that these liquids have practically no effect on Portland cement; the same is true if the phosphoric acid and the sulphuric acid forms a protecting coat.

Owing to the presence of various acids beer attacks Portland cement; moreover, the carbon dioxide forms bicarbonate with the calcium hydroxide. Hence, unless great care is exercised, cement cannot be recommended as a material for vessels for storing beer. Water from hot springs containing sulphur should not be conducted through tubes made of cement, since these are liable to be attracted by the sulphur. Some metals, such as lead, when placed in contact with cement, exert an injurious action on the latter. Cement surfaces may be rendered less porous by saturating them with water-glass solution, hydrofluosilicic acid, fluosilicates, stearic acid, or paraffin wax dissolved in petroleum ether.

Clays and cements absorb and retain complex colouring matters, such as the aniline dyes and carmine, whilst they allow simpler compounds, such as copper sulphate, to diffuse. It is suggested that clays and cements form colloidal hydrates with water—*e.g.*, hydrates of silicon, aluminium, and iron—and that these, owing to their large surface, have high absorptive power.

P. Rohland has further examined the validity of the rule advanced by him first in 1903, and mentioned at the beginning of this digest, that the rate of hydration of calcium sulphate is increased by the addition of substances which render it more soluble, and decreased by those substances which lower its solubility. No exceptions to the rule have been discovered, but certain salts, such as sodium chloride and ammonium sulphate, are found to affect the solubility of calcium sulphate, according to their concentration, in opposite directions, and they may be made, therefore, to hasten or retard its hydration. Hydration takes place in solution only, and, as the solubility of the hemihydrate is much greater than that of the dihydrate, the solution becomes supersaturated as regards the latter, which, therefore, separates as a solid, and this process necessarily takes place more rapidly in the presence of any substance capable of increasing the solubility of the hemihydrate.

Gypsum is less soluble in dilute solutions of sodium, ammonium, and magnesium carbonates than it is in water, whereas it is more soluble in strong solutions. Hydration is retarded by dilute solutions and accelerated by strong ones.

ALMSHOUSES AT LYFORD, BERKS.

A VERY interesting group of almshouses of a humble and unpretentious type are those at Lyford, about six miles from Abingdon, in Berkshire. The buildings are of brick, and are quadrangular in form, the chapel being on the west side. The charity was originally founded in 1611 by Oliver Ashcombe, a native of Lyford, for the poor of East and West Hanney and Lyford. The revenue is now 300*l.* per annum. Each of the twenty inmates receive four shillings a week.

SIDNEY HEATH.

THE ARCHITECTURAL ASSOCIATION.

SYLLABUS OF MEETINGS.

WE have received from the Architectural Association the curriculum of the School of Architecture for the coming session, from which we extract the following syllabus of meetings:—

1909.

October 8.—Annual General Meeting: President's Address and Distribution of Prizes. Mr. Henry Tanner, F.R.I.B.A., President.

October 22.—The Architectural Association Excursion to Cheltenham and District, 1909, by Mr. F. Dare Clapham, F.R.I.B.A.

November 5.—Drainage and Sewage Disposal, by Mr. W. D. Scott-Moncrieff.

November 19.—Architecture of the Incas of Peru, by Mr. C. Reginald Enock, F.R.G.S.

November 24.—Conversazione at 8 p.m.

December 10.—Varallo, Orta, and Varese, by Mr. F. C. Eden.

1910.

January 14.—A Comparison between English and Continental Ornamental Ironwork, by Mr. J. Starkie Gardner.

February 4.—Renaissance Church Architecture in France during the XVIth Century, by Mr. W. H. Ward, A.R.I.B.A.

February 18.—The Life and Work of William Butterfield, by Mr. E. Swinfen Harris, F.R.I.B.A.

March 4.—The Mediæval House, by Mr. J. Alfred Gotch, F.R.I.B.A.

March 18.—Filippo Brunelleschi and the Renaissance, by Professor Beresford Pite, F.R.I.B.A. Nomination of Officers.

April 29.—The Architecture of Bath, by Mr. Mowbray A. Green, F.R.I.B.A. Election of Officers.

May 5.—Members' Dinner.

THE SUPERVISION OF BRICKWORK.

BY A CLERK OF WORKS.

IN the majority of buildings that have been and are being erected the greater part of the walls are brick. If the elevations are of stone or terra-cotta, these will be brick backed. Supervision in some trades and classes of work only occupies a small proportion of the whole time of the contract, such as plumbers' and slaters' work, but with brickwork it commences soon after the

Almshouses at Lyford Berks.

commencement of the contract and continues often for some time after the building is covered in. At no time during that period must the vigilance of the clerk of works diminish, as it is equally as important properly to supervise the top brickwork of the building as it is to watch and check the materials and workmanship of the bricklayers in the brickwork of foundations and footings, etc.

The materials themselves will first engage the attention of the clerk of works, and too great care cannot be given to the selection of the bricks. The builders will submit samples of those they propose to use both for common brickwork and for the several kinds of facings. These last will be more particularly described in the specification, where the height four courses are to rise either laid dry or in the work may be specifically mentioned, or, if not, this point will receive urgent consideration in approving of a sample, this particular is the more important where stone dressings, etc., have to bond in with the facings, such as for instance string courses or window-sills, or mouldings of stone jambs to openings breaking out into knees near sill or head, where the thickness or height of these is designed to be the height of a certain number of courses laid. From this it will be seen that thickness of the bricks is most important for the facings, and equally so for the common bricks used for backing up and general walling purposes, as each have to bond in with the other, and variation in thickness will mean an inequality of the mortar joints, which is very undesirable. Width and length will also have to be considered. The working length of a brick is best when it is twice the width plus a mortar joint; that is obvious.

It is unwise to accept the actual sample submitted by a builder, though as regards colour and substance it may be excellent; but the clerk of works is advised to visit the brickworks and inspect the stacks, etc., for himself. By so doing he can see for himself if the sample submitted is a fair sample of the bulk as regards colour, quality, and dimensions. This last is as important to good work as the other two. As regards thickness, mention has been made of this above, and width has been incidentally spoken of also. The length calls for further attention, particularly in facings. If they are not all of one length (within the smallest of variations), difficulty will be encountered in keeping the perpends, and one of the most noticeable of bricklayer's errors is failure to keep these; and nothing looks worse. In above a small variation is mentioned as allowable; this is but reasonable, seeing that bricks are but a manufactured article of clays, all of which do not shrink uniformly, even if from the same district or even the same pit; and variation will ensue from the various degrees of temperature to which the several parts of the kilns, etc., are subjected. Still, the variation in lengths should be but small, as it is most important to keep true perpends, and, to ensure the trueness of these, the bricks, if varying greatly in their length, must be cut or filed.

Besides looking to uniformity of colour, their good quality and dimensions, trueness of shape, and straightness of arris must be thought of, too. Bricks, concave or convex on plan, on facing side are objectionable; it renders it more difficult to do true work, as it is less easy for the bricklayer to work true to the line, and also to build the wall plumb under such conditions. The same former difficulty is experienced when the bricks are hollow or rounded on bed, and the appearance is spoiled by a series of miniature switchbacks in the arrises of the bricks; particularly is this so where the mortar joints are wide and the weatherstruck joint is deeply set back, say 45 deg., or equal to the thickness of the joint.

Still, a further consideration is necessary—the output of the suggested bricks. The quality and colour, and, in fact, every desirable condition and characteristics of good bricks attain, but it would be the height of folly to approve of a brick (for a large contract) that is only manufactured in comparatively small numbers and no stock is kept to draw against. An accident in the making would mean delay that the contractor could ill afford and the architect or building owner not desire.

A few words may perhaps here be said on what would govern the selection of the bricks as regards quality and fitness for the proposed works. They should be regular in shape and size, with good straight and sharp arrises, and free from lumps, flaws, and cracks of all kinds. The lumps may be particles of free lime, which under moisture would expand and damage the work in which the bricks containing them are built; and cracks, though small at first, may extend and make bats of what were put in as whole bricks, to the detriment of bond; as also, if in the facing, they will show dark black lines when weathered in the wall, thus spoiling the appearance.

For practical tests, the sound emitted by striking two together gives a rough idea of their fitness, their soundness, and the thoroughness of burning—a clear ringing note from those well burnt and sound, and a dull note from one underburnt or cracked. A load of good bricks tipped up from the cart should yield but few bats; if large numbers result from such shooting out of carts, many more are likely to result from the several handlings on the job; the bricks are too soft, cracked, or underburnt to make good work.

The mortar and the materials from which it is made will require attention. The specification will define the proportions, and the clerk of works will be constantly on the alert to prevent an overabundance of the cheaper ingredients of the mortar. The specification will also prescribe the kinds of lime and sand to be used, and the clerk of works will note that those specified are delivered. For mortar, pit sand is preferable to river sand, as it is more sharp as a consequence of its grains being angular in shape, as against the rounded shape of those of river sand; but the former is likely to be less pure than the latter, often containing loamy or foreign matter, which will prevent that complete union of sand and lime which is essential to good mortar. Sand is occasionally unobtainable in or near the locality of the works, when the builders may propose substitutes, such as furnace slag, coke breeze, or burnt ballast to be ground in a mill. In such a case the clerk of works will obtain his architect's instructions. In order to ensure the correctness of the gauge the ballast, or whatever is used, should be ground separately first, as its bulk before and after grinding will differ. In mill-ground mortar the clerk of works will see that it is not overground. Testing mortar requires a chemical analysis, which clerks of works cannot be expected to undertake, but if the clerk of works has had previous knowledge of the same lime, he will be able to judge the correctness of the mortar on a later job. If on his prior job, where he meets this particular lime, he beds a brick on the face of a wall with the mortar made from such lime, and supports such brick until the mortar has set, and then adds another brick to the face of the last, and so on until the weight of the bricks becomes too much for the mortar to carry, he can by a similar test on a subsequent job ascertain within a fair degree of accuracy the quality of the mortar being used on that works from the knowledge he obtained from his first test with the same lime (and proportions) on the previous contract. Another point for his observation and action is that only sufficient for the day's consumption is used, and any left over should not be allowed to be knocked up and reused, and equally so with cement mortar. This last should only be mixed in small quantities, and also that which has been made up over an hour, or which has commenced to set, should not be used or knocked up again and reused. All sand used for cement mortar should be washed. It is not proposed here to make any remarks on the quality of the cement, its testing, or its storage.

Leaving the materials used by the bricklayer, and coming to the actual work, one of the chief points calling for attention is the proper flushing up of the joints. This is most essential if good solid work is to result, and when bricks have large frogs (and this is generally the case with glazed bricks), if the bed of mortar spread is not of sufficient thickness to fill same when the brick is "shoved" into its position, then the clerk of works will insist on the bricklayer filling up such frogs before the bricks are laid It will be easier for supervision if he insists on the frog side of all bricks (if only one frog) to be laid uppermost. Grouting should never be resorted to when the joints are large enough to fill up properly; but, of course, for gauged work, etc., it has to be allowed.

If the concrete foundations have been put in roughly and the top is not level, the bricklayer putting in the footings may have to lay the bricks on edge or to cut the bricks if they are to be laid flat. This would, of course, be obviated if proper supervision had been given to the concrete work.

In order to prevent the bricks soaking up the water from the mortar, and to remove any dust which would be injurious to the setting properties of the mortar, they should be soaked prior to using.

When new work joins old cutting, toothing, and bonding the former to the latter is necessary if toothings have not been left in the old for the new work to pick up into. This work should be done in cement.

Snap-headers in work not requiring them to make bond must be looked for, but it must not be forgotten that some bonds entail their use. In the case of 9-in. walls faced both sides with different facings snap-headers must be used if any other than stretcher bond is required; such walls should be liberally tied together with galvanised or tarred and sanded hoop-iron ties, and be built in cement; and if they are such that the pointing cannot be done at once, *i.e.*, while the work proceeds, the joints, being in cement, should be raked out clearly immediately, as to do so after the mortar has set is to court damage to the arrises of the bricks.

The pointing of the walls will need close supervision. If the specification states the facings to be pointed as the work proceeds, and the weather is unfavourable, the clerk of works will ask for this to be left, and if the builder has to leave the pointing perfect at completion, he will readily agree.

The clerk of works will watch that each fire opening has a separate flue and that the withes are properly tied in, and that in pargeting the flues ordinary mortar is not used, but that hair is added, and cow-dung, if specified. In the case of the flues being on an outside wall, to prevent the likelihood of a builder subsequently accidentally cutting into them when building operations are in hand on the adjoining land the outline of the flues and withes should be marked on the flank wall in white paint, as prevention is better than cure, and in such cases as these it is impossible to reparget over the disturbed part of the flue.

If any underpinning is necessary, this must be carried out in short sections not exceeding 3 ft. long, and a quick-setting cement and the hardest of bricks must be used, and the wedging up should be with stout slate.

In arches, unless of specially moulded bricks, no details will be needed from the architect, but to all arches the clerk of works will note that proper skewbacks are cut—not too straight nor too inclined. All arches should act as arches. For gauged arches the clerk of works should check the setting out and inspect the templates, and in the finished work all the joints should be of one thickness—penny joint—and be made of lime putty (shellac if for carving). The bricks should have a channel or groove cut in each side to take the cement grout, which is poured in when all the voussoirs are in position.

Gauged arches are built up from both sides, and the key brick inserted last.

The clerk of works will insist on proper protection being given to the walls from rain, frost, etc., by covering them up with weather boards, sacks, etc., care being taken that the rain is projected off the face of the walls, and that no damage is done to the executed work by the actual labour or materials employed in covering up.

As regards the setting out of the brickwork, this is no part of the clerk of works' duties; he will, of course, check the same, but by no means should he take upon himself the responsibility of any duty that properly belongs to the foreman.

It is impossible always to carry all walls up equally from bottom to top all round the building. Rolled steel joists, stone dressings, or stairs may, among other goods, by delay in delivery, necessitate a stoppage at a certain point, in which case the wall should be raked back. Toothings should be allowed to be left under such circumstances, and no one wall should be carried up more than 3 ft. above another even if raked back, and then it is advisable to pick up the "raked back" courses in cement mortar to minimise the chance of settlement.

With hollow walls careful supervision is necessary to ensure that the specified number of ties find their way into the work and the cavities are left clear of mortar droppings, shavings, etc.

The dampcourse might be mentioned as a brickwork item. The clerk of works will see that one is put to all walls requiring one. If of slates, that they are stout, laid to break joint, and properly bedded; if of asphalt, that it is of the specified thickness; and where vertical dampcourse meets horizontal that a good joint is made and angle fillets put where necessary.

The clerk of works will be called upon to measure up all variations in hidden work and to get the foreman's signature to such, and to keep detail sections of the work as carried out, where variations, additions, or omissions have been made.

In conclusion, just as a man, a carpenter by trade, would make the best clerk of works for a building where half-timbered work domes and timber construction forms the most important items in the contract, and a man, a mason by trade, be one of the best to supervise the erection of a job where the stonework is the most important feature, so should a man, a bricklayer by trade, make an excellent clerk of works for a building in which the chief architectural points are its brick gauged arches, pilasters, aprons, and dressings.

DANGEROUS STRUCTURES.

IN our issue for July 10, page 40, we gave part of a paper read by Mr. E. Willis, A.M.Inst.C.E. (Surveyor to the Urban District Council, Chiswick), before the Institution of County and Municipal Engineers, on the occasion of the annual meeting of that body in London at the end of June. The following is the second part of Mr. Willis's paper:—

Having raised some points for discussion, the author now proposes to give a few examples of dangerous structures which he has had occasion to deal with.

Overhanging Cornices.—The heavy overhanging cornices, always met with in cases of classic ornament, require to be carefully watched to ascertain whether the stone is laid on its natural bed or whether it is laid at right angles thereto. The former condition is structurally better from some points of view, but from that now under consideration it is very disadvantageous, since large pieces are liable to flake off during the winter and spring, from the action of frost having attacked the moisture in the laminations, and drop upon the pathway.

In similar stucco cornices, which in old houses are usually found to be constructed of Roman cement with tiles for the core on rough York corbels, the author has known of whole terraces of shops where this class of work was condemned owing to the frost having penetrated into same.

He has always advocated smaller projections during the time of reinstatement, and this procedure should largely eliminate further trouble, especialy as Portland cement is now more often used and is more reliable and efficient than Roman.

It is to guard against the loss of life occasioned by the periodical dropping of portions of these cornices that the author has thought it advisable to emphasise the desirability of a thorough inspection being made throughout all the older property of this character, as the ordinary house-to-house visitation of the sanitary inspector entirely overlooks the important element of danger mentioned above, and it must be admitted that this is not confined to the poorer class of property, but is often found in some of the best class of shops in the London suburbs and country towns.

Gutters.—The cast-iron gutter is another frequent source of trouble, since the heads of the screws in the case of the O.G. gutter invariably rust off, whilst the old-fashioned semicircular gutter on brackets often falls by reason of the corrosion of these latter fixings.

Party-wall Parapets and Kneelers.—The principal trouble in connexion with party-wall parapets occurs in property built by speculating builders, where, to avoid the cost of cutting facing bricks and the provision of stepped flashing, they have provided the portion of the wall above the roof with joints at angles of from 25° upwards. Whilst it must be admitted that this is not technically in conformity with the model by-laws, yet it is the regular practice adopted by many speculating builders, and it can easily be understood how the weight of the superincumbent parapet-wall acting upon a small projecting kneeler will, if once loosened, speedily cause the whole or a large quantity to slide, unless thoroughly tied in by iron or other suitable material.

Piers and Pier Caps.—The small piers of forecourt walls are another frequent source of notices under the Dangerous Structures Clause, since it is quite easy for the 9-in. or 14-in. pier, usually seen in front of suburban residences, to become dislodged by the slamming of iron gates, or the accidental damage by furniture or heavy dustbins to such an extent that a child may cause the final overthrow of same, and it is this very risk that renders it necessary for the surveyor to keep his eyes opened to the possibility of the existence of these defects where least expected.

Boundary Walls.—A somewhat peculiar case under this heading recently came under the author's notice. A boundary wall of nearly 16 ft. in height was overhanging upwards of 9 in., and as such in this instance was undoubtedly dangerous; but the lower portion of the wall was in the Metropolis, and the upper portion in his district. He accordingly served notices, and officially notified the district surveyor responsible, with the result that immediate action was taken and the whole wall rebuilt.

It is, of course, a question for the surveyor to ascertain before any notice is served, as to whether the wall concerned is actually dangerous or not. The author has seen walls overhanging to a greater extent than their own thickness, and has yet not felt justified in taking action upon same, and it is in cases of this kind where the practical experience, necessary in enforcing this clause of the Statute, becomes of such great importance.

Chimney-pots and Chimney-stacks.—It is possible that in no district would every chimney-pot or chimney-stack be found absolutely safe if same were examined, but it is also probable that in every well-supervised district the number of dangerous chimney-pots would be extremely small, and the author feels it cannot be too strongly urged upon surveyors that a periodica inspection, especially prior to the winter months, should be made with especial reference to this class of dangerous structure.

Chimney-pots are usually found defective after some slight chimney fire, insufficient to cause trouble to the occupier, but enough to render them unsafe by reason of the cement flaunching being seriously cracked, and the pot in a similar condition. When this result obtains, and a high wind arises, it is no uncommon thing, if care has not been exercised in the administration of the district, to hear of numbers of chimney-pots having fallen, and it is surprising that more accidents do not occur from this cause.

In dealing with dangerous chimney-stacks, the author has been sometimes satisfied with tie-rods, but in the case of old work entire rebuilding is usually more desirable. Even loose bricks on the top caused by the destroying action of the weather upon the mortar joints, are sufficient to give cause for anxiety, and the author recollects taking a case of this kind successfully before the court.

Bulging Walls.—The subject of bulging walls does not often arise except in the case of old property or after fires, and can usually be dealt with by means of tie-rods, which should be carried if possible at the level of the floor joists. In one case, however, the writer found a 9-in. wall supporting an improperly constructed tiled roof, overhanging an average of three inches due to the spreading of the roof, and serious damage was only averted by a number of tie-rods being taken through the roof itself, as well as additional struts being provided.

Coping-stones.—The cause of coping-stones becoming dangerous is, of course, due to natural decay, frost, or to dislodgment by external causes. It is not often that statutory notices become necessary for this class of defect, but where stone copings have been utilised on party and external walls projecting above roofs, and the bottom edge has been cut to the splay, the author has had occasion to serve notices respecting them when they have commenced to slide forward owing to the mortar or cement having perished, since the friction has been insufficient to withstand the weight of the upper stones in the case of high-pitched roofs.

Overhanging Balconies.—The same remarks to some extent as were made in connexion with heavy cornices apply to balconies, but with this exception, that in a good deal of old-class property these balconies are constructed of wood, and where same are of any length, it is often found that the wood, although insufficient to support one or two adults, would be totally inadequate for a crowd, and, as such, action sometimes becomes necessary.

It is especially advisable in the case of all public functions for these to be very carefully examined by the surveyor and, if necessary, repaired, shored up, or otherwise supported prior to the date of such function, when it might be anticipated they would be unduly crowded.

Fences and Gates.—It is a question whether these technically come within the section under consideration, but the author has on several occasions found it necessary to press for repairs where the same were becoming dangerous to passengers along the highway, and he is glad to state he has hitherto been able to get the necessary work done without undue friction.

Loose Tiles and Slates.—It is not often that the surveyor can keep a watch upon this cause of danger to the public, and, however careful he may be, many of these constantly fall at times of high wind or gales.

In looking through notes of past work, the author finds he has never had occasion to deal with this particular class of dangerous structure by notice, but in the few cases where they have been observed, repair has been effected, so that the risk to the public has been lessened, even though not entirely eliminated.

Shop Blinds and Street Signs.—Sect. 28

of the Town Police Clauses Act, 1847, as is known by all municipal surveyors, deals with the height of these structures, but beyond this in some districts apparently no special attention is paid to the fixing of same.

It has been the practice in the author's district for some time past to obtain sketches with written applications to the Council before allowing the erection of any sign of a heavy character, and this practice is found to result in distinct benefit to the public, with but little hardship to the tradesmen. In some instances the author has found the proposed methods of fixing totally inadequate, and the result of erecting these signs in the form originally proposed, had such been allowed, would have been undoubtedly sanctioning serious risks to the public.

Joint Staircases and Landings.—In the case of flats and places where many families are congregated it seems desirable to include any defects in connexion with joint or public staircases under the class of structure now being considered.

The only practical experience of the author in this respect has been in the case of old property with external wood staircases admitting to several dwellings, and in the case of defects in these he has taken action under this clause, but it also appears to him that any defect in entrances and exits to flats might be treated in a similar manner, and he would personally much appreciate any observations from the members with regard thereto as to their experience in this matter.

Flêches, Vanes, and Lightning Conductors.—As a general rule these are sufficiently safeguarded and watched by the surveyors to the owners of the premises on which they may be fixed, as in most cases where the above are adopted the owner has his own architect or surveyor, who is more or less permanently engaged by him, and should any slight defect appear, he would probably be notified thereof, or would observe same in his periodical inspections before serious damage arose. There are cases, however, where nobody accepts responsibility, and it is to these that the local authority's representative should particularly give periodical inspections and attention.

In the case of high chimneys, the sulphurous and other gases sometimes affect the materials to which, being well above the ordinary line of sight, no attention is given until some piece of mortar, brickwork, masonry, or corroded metal falls to the ground, and it therefore does behove the surveyor to bear these structures in mind, and by safeguarding the public also assist factory owners, church, or other authorities indirectly by his practical knowledge.

Fires.—The question of fires and the resulting dangerous structures, is such a wide one that the author does not propose to deal in detail with same. What he does suggest, and the principle he has personally adopted, is for all serious fires to be immediately notified to him, and for an inspection of the property to be made at once, with a view of ascertaining whether any special measures need be taken for the safety of the public in the event of walls, chimneys, roofs, or other portions of the building, being liable to fall outside of the immediate boundaries of the damaged or destroyed property.

New Buildings.—It seems somewhat strange in a paper of this kind to classify new buildings under the heading of dangerous structures, but a point of some interest actually came within the author's experience, and as such he thinks it might be interesting to his professional brethren.

A new 9-in. external wall built as a party wall, about 28 ft. in length, comprising two stories and a gable, had been erected by a speculating builder. It had been built very quickly, principally of bats and not properly bonded, between the times of the periodical inspections by the surveyor, and when seen by him he noticed the imperfections, and immediately warned the builder that it would have to be pulled down and rebuilt.

The builder, however, proceeded to roof in same, and before the notice served upon him had been complied with a strong gale arose, which, acting on the inside of the wall, it being to some extent confined by the roof and rear walls, caused upwards of 20 ft. to fall outwards. This was an instance of where a new building became a dangerous structure before it was out of the builder's hands, as some children had been playing on the ground over which it fell, and would have been killed or seriously injured had the collapse occurred a few minutes earlier.

Underpinning and Shoring.—The writer already feels his paper of sufficient length, and he therefore does not think it desirable to deal in detail with the underpinning or shoring up naturally required in some of the foregoing cases, although both are complementary to the subject of dangerous structures.

He has refrained from dealing with London practice or conditions which exist in mining districts, since there are many members more fitted to deal with these than himself, and he does not in any way wish to imply that these few notes form a complete record of the portions of buildings, etc., which may or do in fact become dangerous, but he has endeavoured to collect some of the general items which he has actually met with in practice during the last twenty years, and he trusts they may form the basis of a discussion which may be of advantage to at least some of his professional brethren.

Legal Column.

Right to Make a Tunnel.

In this case, South-Eastern Railway *v.* Associated Portland Cement Manufacturers, Ltd., the defendants were assigns of a lease of certain land on each side of the railway with the right of working chalk under the land. That lease purported to confer upon them the rights and privileges of a certain agreement made between the railway company and the lessors' predecessor in title many years before, that the lessees or their assigns, under certain conditions, should be at liberty to construct a tunnel under the line. This necessitated no interference with the traffic, nor did it involve any engineering difficulties, but the railway company questioned the legal rights of the defendants to undertake the work on the ground that the provision in the agreement was uncertain and indefinite, and that it was void as tending to a perpetuity. The hearing of the action occupied four days, and the learned judge of the Chancery Division found for the defendants. The decision turns upon some subtle legal distinctions between "exceptions" in conveyances, *i.e.*, the taking out of some part from what has been expressed to be granted, and "reservations" which relate to some new thing out of that granted, greater definiteness being required in the former than the latter. Here the provision was a reservation of an easement, and granted by the plaintiffs, the railway company themselves, and the Court held that the defendants had a legal right to exercise the easement as assignees of the agreement.

Revocation of Patents.

The Comptroller-General of Patents has given a decision under sect. 27 of the Patents and Designs Act which may be briefly referred to as illustrating the application of principles laid down in former cases noted in these pages.

The patent which it was being sought to revoke related to mills for crushing such material as quartz, and especially to the ring and rolls. The proprietor of this patent carried on business in the United States, but in consequence of the passing of the Act he appointed an agent in this country, who inserted advertisements, and an English firm was entrusted with the manufacture of the mills. In November, 1908, the first machine was completed, but many of the parts had been imported from America. A second machine was then commenced, but not completed until July, 1909, the excuse for the delay being that some improved portions under a later patent were being expected from America, and that there was no immediate demand for the machine here. For this machine the rolls and ring were imported from America, but a third machine was in process of manufacture, the rough castings for which had all been made in England. The mills were only made outside the United States as above and in Germany, but the demand in foreign countries was about two machines a year, and the two machines completed had been sold here. The Comptroller held (1) that there had been no undue preference given to foreign countries, nor had the patentee hampered himself in carrying out his obligation to manufacture here, and the manufacture, in fact, was sufficient to meet the present demand; (2) that the importation of certain material parts was explained sufficiently by the desire of the patentee not to prejudice the early sales by obtaining inferior material, and there was evidence that the machine might shortly be completely manufactured here; (3) that the price asked was a *bona-fide* price, being, in fact, the same as America and elsewhere, and was not intended to diminish the demand here. Therefore the Comptroller decided that at present the case for revocation failed, though an application could again be made should the manufacture be inadequately carried on at any future time.

Gas Companies' Liabilities.

A recent decision in the Privy Council raised some interesting points in connexion with the liability of gas companies. The defendants were the Dominion Natural Gas Company and the Toronto, Hamilton, and Buffalo Railway Company, the plaintiffs being certain workmen in the employ of the latter company or their representatives who had suffered injury from a gas explosion. The gas company, in consideration of obtaining a wayleave for one of their mains, had contracted to supply the railway company with gas at reduced rates and to furnish meters and regulators. The gas was a natural gas, which was obtained at very high pressure, and it was necessary to reduce the pressure before it was used. Part of the apparatus employed to effect this object was a safety valve. The plaintiffs were suing both companies. The railway company contended that there was no negligence on their part and that they had discharged their duty by employing competent persons—the gas company—to provide the system. The gas company alleged, however, that the servants of the railway company had interfered with the apparatus, and it was proved that they had inserted a tap before the pipe entered the regulator, and had also hammered the safety valve. The Courts in Canada had found against the gas company, and that company appealed to the Privy Council. There being no contractual obligation between the plaintiffs and the gas company the Court had to consider what duty the gas company owed to the plaintiffs, and it held on decided cases that in the case of the supply of articles dangerous in themselves a peculiar duty was imposed on those supplying them, and that in the absence of due precaution it was no defence to say the accident would not have happened but for some other agency unless the proximate cause was the conscious act of the other agency. In the case in question the jury had found that there was negligence because the safety valve was installed with an emission into the shop instead of into the open air. The true cause of the escape of gas was left in doubt, but it occurred at the safety valve, not at the tap inserted by the servants of the railway company, and the Court held that, initial negligence having been found against the gas company, they had failed to prove that the proximate cause of the accident was due to the intervention of the Railway Company's servants and that the gas company were liable.

THE BUILDER

AUGUST 28, 1909.

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MEETING.

WEDNESDAY, SEPTEMBER 1.

Builders' Foremen and Clerks of Works' Institution.—Ordinary meeting of the members.

Illustrations.

PROPOSED ADDITIONS TO THE TOWN HALL, STOKE-UPON-TRENT.

WE illustrate this week Messrs. Warwick & Hall's design for the proposed additions to the Town Hall, Stoke-on-Trent. As we stated last week, this design was placed second by the assessor, and the second premium was awarded them by the Town Council. As in the opinion of the Council the cost of the first and third designs was excessive, these premiums were not awarded. Messrs. Warwick & Hall reported on their design as follows:—

In preparing the accompanying design, particular care has been taken in the planning of the large hall, small hall, and court, so that each one is entirely distinct, with separate entrances from the street, and yet they may be all used together or in conjunction with the existing buildings. The present entrance is thus utilised to the fullest possible extent, and the existing staircase is remodelled on a scale suitable to the new surroundings.

The committee rooms and spare rooms are so placed that they may be used in connection with every part of the building for the purpose of retiring rooms, refreshment or jury rooms, etc.

The existing buildings are not altered except in the matter of the new staircase, and the mortuary and stable buildings are untouched.

The large store in the present basement, and the means of access thereto, will remain unaltered.

The basement kitchen is connected by lifts to the serving-room on the first-floor, adjoining both the present assembly-room and the new supper-room, in both of which banquets may be served direct.

The elevations carry the horizontal lines of the existing buildings, and conform to them in general character.

DESIGN FOR BURSLEM MUNICIPAL BUILDINGS.

THE general lines of the design are dictated by the necessity for absolute economy to meet the somewhat inadequate limit of cost. The simple symmetrical grouping naturally arises out of the positions into which the large hall, small hall, and courts necessarily arrange themselves on the site, and the treatment of the external design in a rather simple manner is prompted by a desire to keep in character with the surroundings in which the buildings are to be placed.

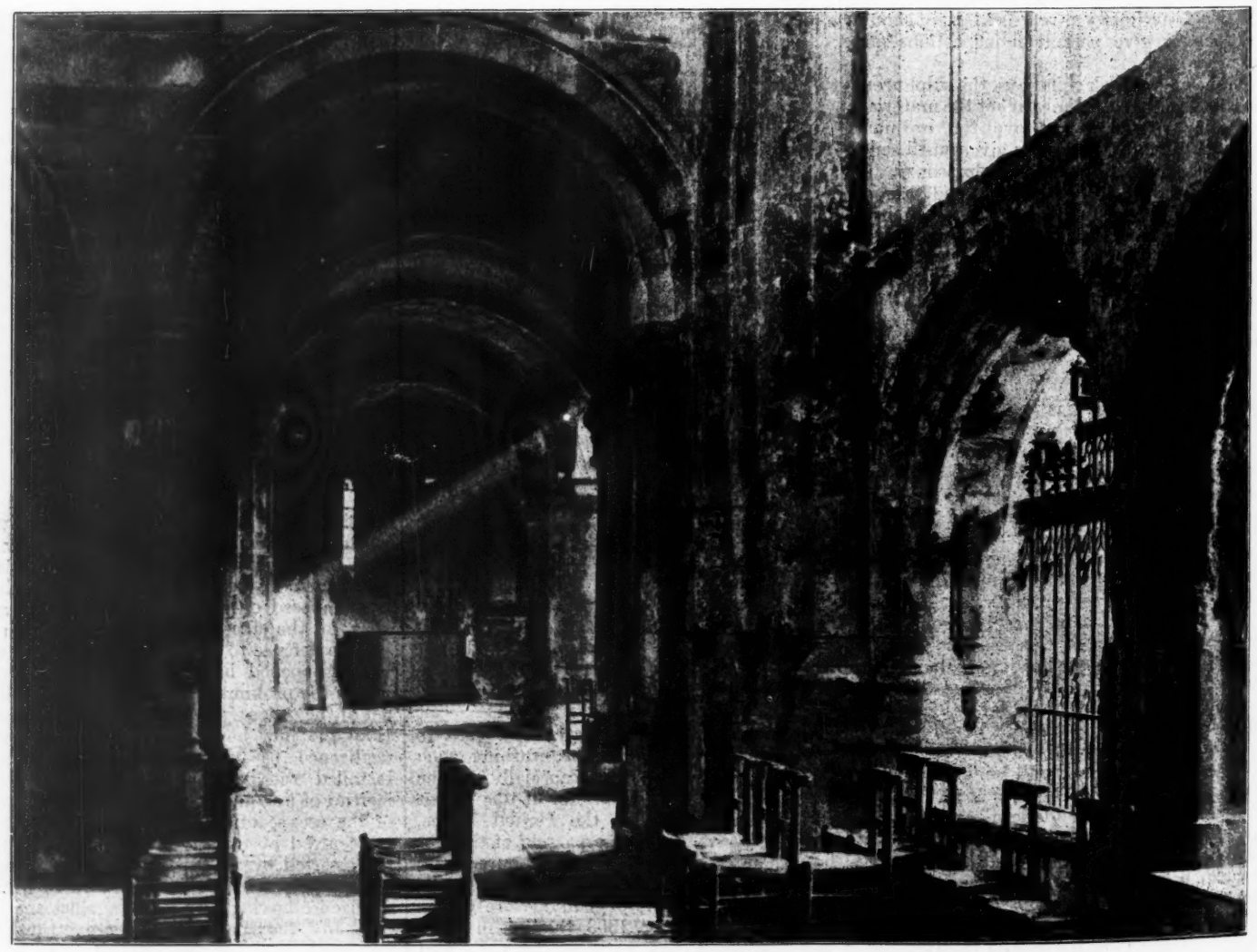
E. MONTAGUE THOMAS.

NORTH AISLE, ST. BARTHOLOMEW, SMITHFIELD.

THE illustration shows the north choir aisle of St. Bartholomew's, Smithfield. One of the later pointed arches is seen in the foreground, and beyond it the Norman arcade and the commencement of the bend of the apse.

The illustration is from a photograph by Miss A. G. Weaver, of Hampstead.

NEW CHURCH, CATCLIFFE.—At the mining village of Catcliffe, near Rotherham, the foundation-stone of a new church, to be dedicated to St. Mary, was recently laid. When completed the building will provide accommodation for 300 people. The contractors are Messrs. Thomas Roper & Sons, Ltd., of Sheffield, who are carrying out the work under the personal superintendence of the architect, Mr. J. E. Knight, of Rotherham.

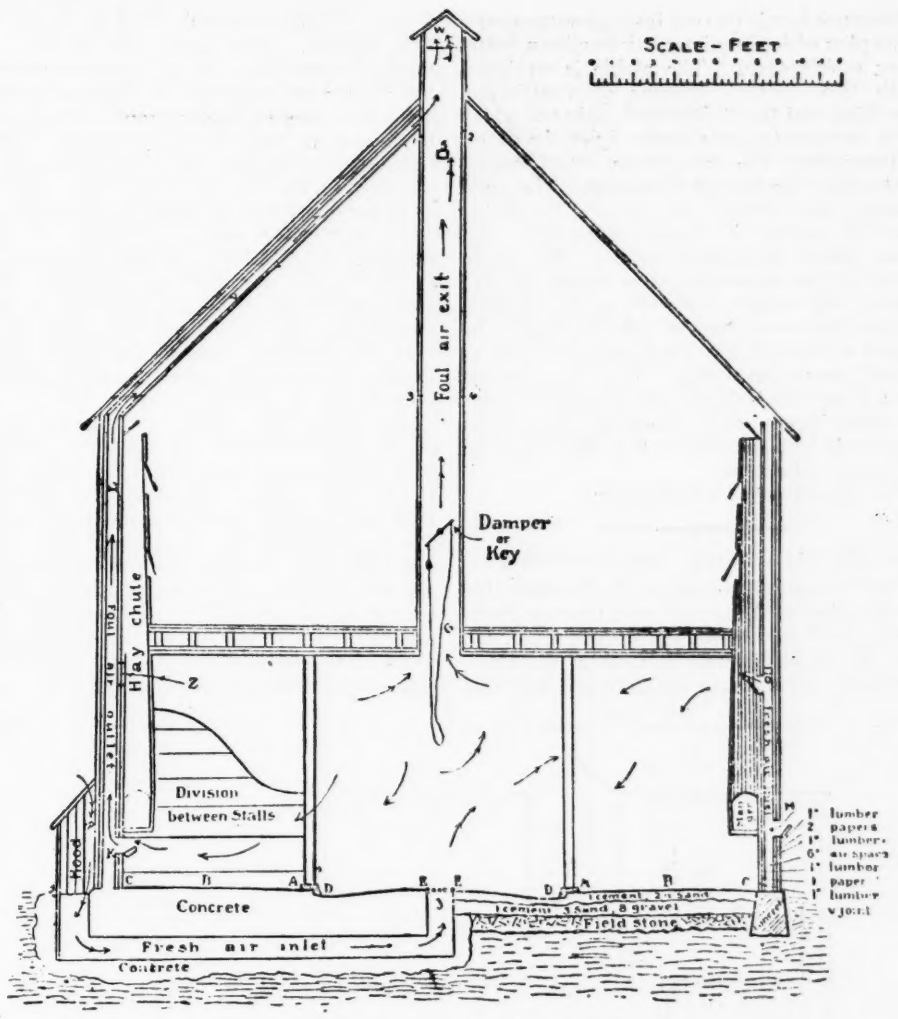


View in North Aisle, St. Bartholomew, Smithfield. From a photograph by Miss A. G. Weaver.

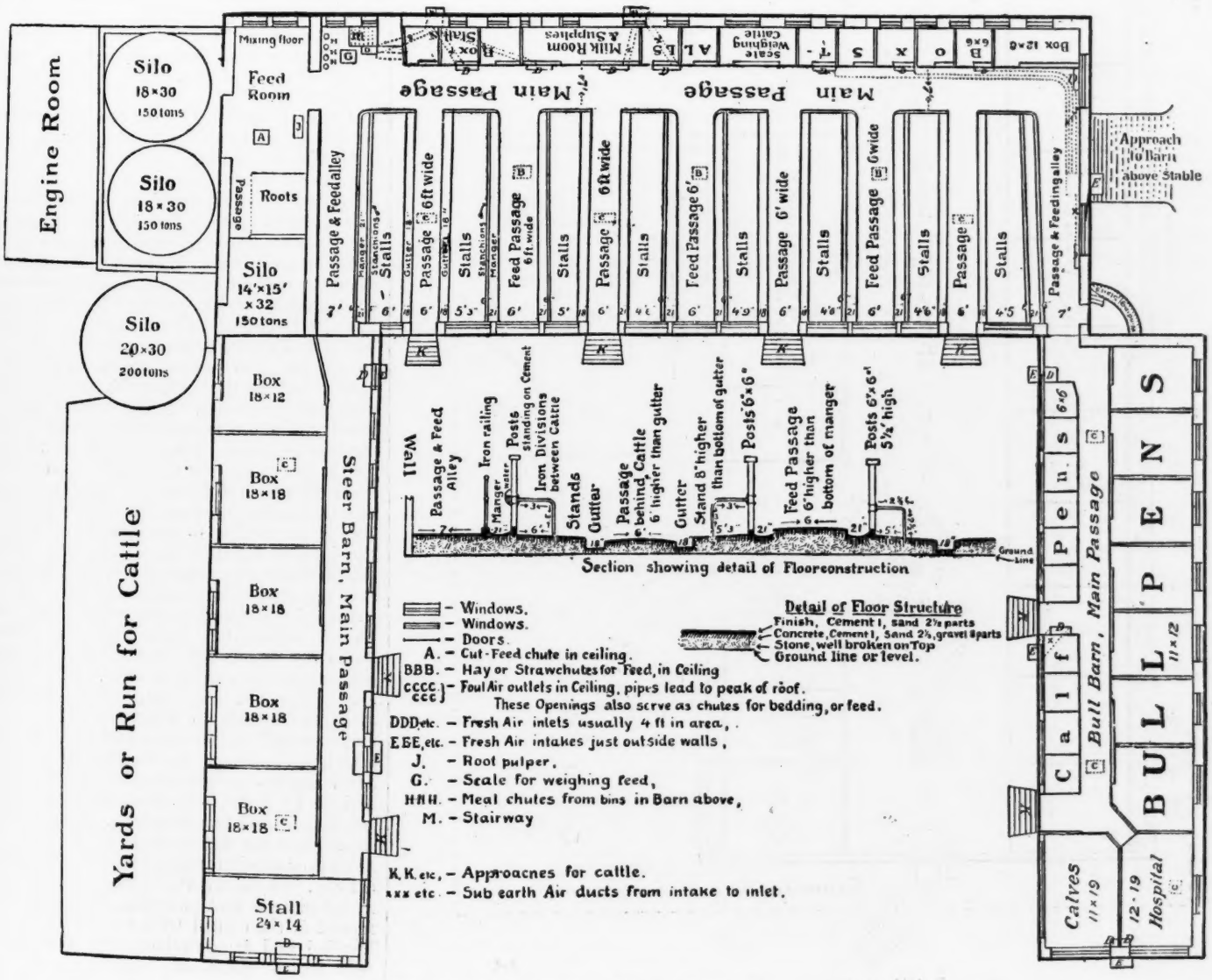
MODEL FARM BUILDINGS, OTTAWA, CANADA.

PROBABLY some amount of interest may attach to the description of a model horse-barn and a model cattle-barn which have been erected by the Canadian Government at the Central Experimental Farm at Ottawa. The particulars are given in the annual Report of the Canadian Minister of Agriculture.

The stables were built to accommodate twenty-three horses. The ground-plan explains itself for the most part, whilst the section shows wall and floor construction and the system of ventilation. The walls, starting at the outside, are built with vertical inch-dressed timber, battens over joints, two building papers; rough lumber, horizontal; 6-in. studs and air space; rough lumber, horizontal; building paper; V-joint inside finish. The ceiling or upper floor is constructed similarly, joists supported by two beams resting on stall posts. The foundation was built of concrete. The floor, a regular cement one, with the necessary pitches or inclines, etc., was built of rather unusual strength on account of its being for horses. A good depth of stone was laid on the ground, a layer of about 5 in. of concrete, one cement, three sand, eight gravel followed, and finished off with a second layer, one part cement, two and a-half parts coarse sand, and half a part crushed granite. The surface of the passages is cut by inch-deep grooves into 6-in. squares. The main passage, 12 ft. wide, is about 3 in. in the centre, descending in a convex slope to immediately behind the horses. The stand for the horses is about 4 in. higher than the gutter or lowest point of the 12-ft. passage. The stands are 9 ft. long, and vary in width from 5 ft. to 6 ft. 1 in. The horses stand on cement. Feed chutes begin at plate and end at manger. The hay chutes are slightly bell-shaped, so that



Farm Buildings, Ottawa: Section of Stables.


Engine Room
Silo 18×30 150 tons
Silo 18×30 150 tons
Silo 14'×15' ×32 150 tons
Silo 20×30 200 tons
Feed Room
Roots
Mixing floor
Box 18×18
Box 18×12
Box 18×18
Box 18×18
Box 18×18
Stall 24×14
Yards or Run for Cattle
Steer Barn, Main Passage
Passage & Feedalley
Main Passage
Box 12×8
Box 6×6
Milk Room & Supplies
Scale Weighing Cattle
Approach to Barn above Stable
Passage & Feedingalley
Bull Barn, Main Passage
Pens
Calf
BULL
Calves 11×19
12·19 Hospital
Section showing detail of Floorconstruction
Wall
Passage & Feed Alley
Iron railing
Manger
Posts standing on Cement
Iron Divisions between Cattle
Stands
Gutter
Passage 6' higher than gutter behind Cattle
Gutter
Stand 8' higher than bottom of gutter
Posts 6×6
Feed Passage 6' higher than bottom of manger
Posts 6×6 5¼' high
Ground line
Detail of Floor Structure
Finish, Cement 1, sand 2½ parts
Concrete, Cement 1, Sand 2½, gravel 8 parts
Stone, well broken on Top
Ground line or level.
= Windows.
= Windows.
= Doors.
A. = Cut-Feed chute in ceiling.
BBB. = Hay or Strawchutes for Feed, in Ceiling
CCCC CCC = Foul Air outlets in Ceiling, pipes lead to peak of roof. These Openings also serve as chutes for bedding, or feed.
DDD, etc. = Fresh Air inlets usually 4 ft in area,
EEE, etc. = Fresh Air intakes just outside walls,
J. = Root pulper,
G. = Scale for weighing feed,
HHH. = Meal chutes from bins in Barn above,
M. = Stairway
K, K, etc. = Approaches for cattle.
xxx etc. = Sub earth Air ducts from intake to inlet.

Farm Buildings, Ottawa: Plan of Cattle Houses.

when once hay is started it drops to mangers. This plan of feeding long hay has been found very satisfactory. The stable is equipped with two distinct systems of ventilation, the King and the Rutherford, either of which may be operated independently of the other.

Describing the cow-house, the Report states that the floor is of cement. The main passages are about 7 ft. wide. The stands vary in length, the largest being 6 ft. 4in. from gutter to stanchion bed. The main house will accommodate about ninety head of cattle, and is lighted by 450 sq. ft. of glass, practically every foot of which admits the direct rays of the sun for a longer or shorter period every sunny day. This shows about 5 sq. ft. of glass or light per head, which helps to render things bright, cheerful, and sanitary. Fresh air is admitted at the floor level by means of air-ducts.

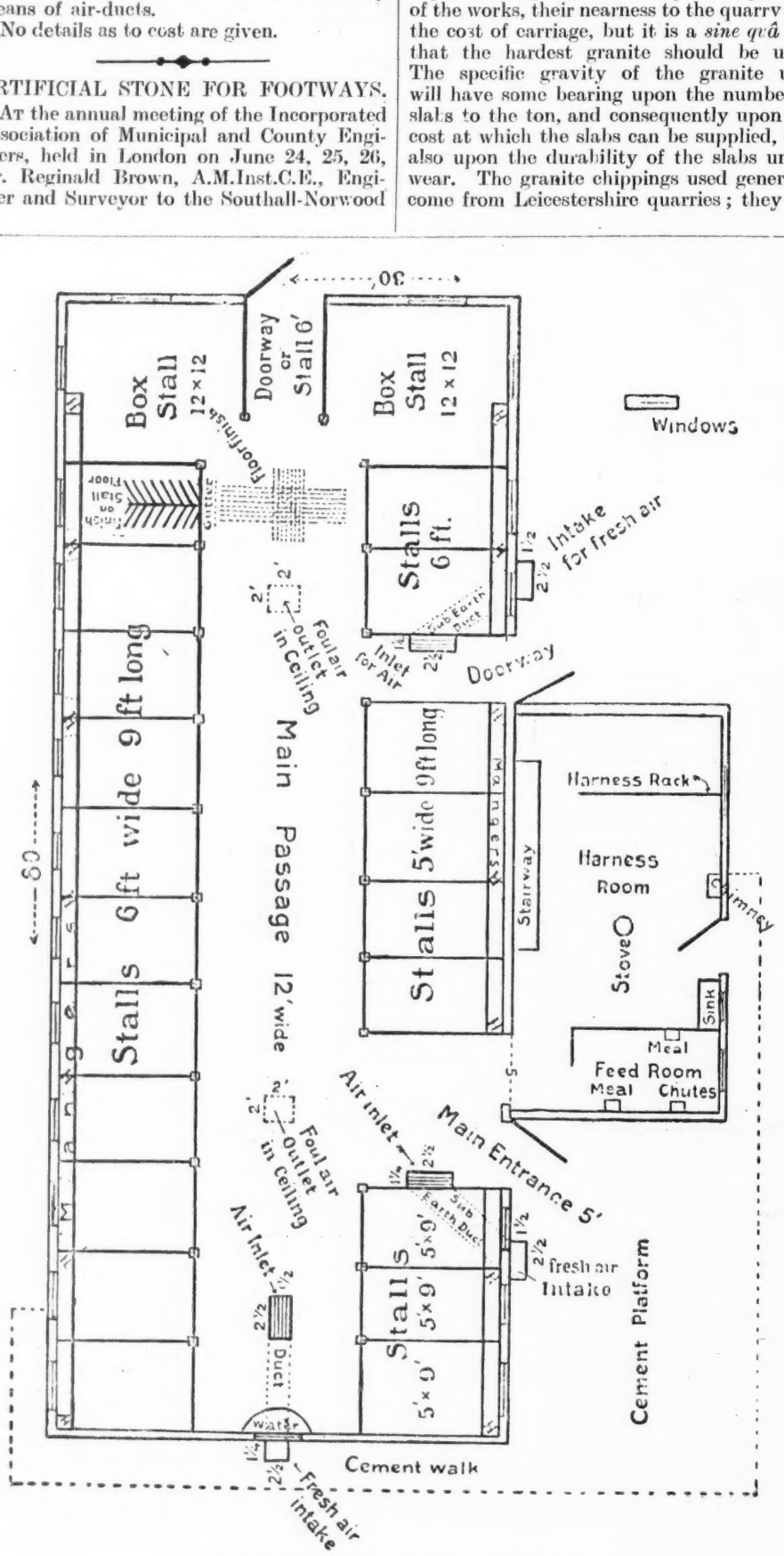
No details as to cost are given.

ARTIFICIAL STONE FOR FOOTWAYS.

AT the annual meeting of the Incorporated Association of Municipal and County Engineers, held in London on June 24, 25, 26, Mr. Reginald Brown, A.M.Inst.C.E., Engineer and Surveyor to the Southall-Norwood Urban District Council, read a paper on this subject. After some preliminary remarks, he said that the materials in general use for the manufacture of artificial paving slabs are granite chippings and cement, but in some cases crushed York stone or crushed clinker takes the place of granite chippings.

Cement.—The best firms are very particular as to the quality of the cement used by them. They have their own specification for the cement, which follows closely on the lines of the British standard specification. The good quality of British cement is so well secured and assured from the best works that the different results obtainable under breaking and wearing tests must be attributed to other causes than the cement.

Aggregate.—The kind of granite used depends in a great measure upon the position of the works, their nearness to the quarry and the cost of carriage, but it is a *sine qvâ non* that the hardest granite should be used. The specific gravity of the granite used will have some bearing upon the number of slabs to the ton, and consequently upon the cost at which the slabs can be supplied, and also upon the durability of the slabs under wear. The granite chippings used generally come from Leicestershire quarries; they are tough and hard and make excellent material, but even with these granites the specific gravity varies from 2·63 to 2·99, so that the slabs made will also vary in weight. Crushed clinker produces a stone which is not so heavy as those made with a heavier and more dense aggregate, such as granite chippings.



Farm Buildings, Ottawa: Plan of Stables.

Size of Aggregate.—The tendency is to use granite chippings crushed to ¼-in. gauge, but as the chief aim is to obtain as dense a concrete as possible, it would be interesting to know whether this could not be attained and a stronger slab manufactured by the admixture of granite chippings so graded in size and in such proportions as would render the percentage of voids at a minimum, and by this means use a smaller quantity of cement.

Cleanness of Aggregate.—Tests have been made from time to time as to the value of eliminating the fine dust from granite chippings preparatory to making up the test cubes, and whilst it is evident that dust, as dust, should not be present, it appears that if the material is properly selected a small amount of granite dust, as *very* fine chippings, affects the strength to a very small degree so long as the dust plus the cementing material does not exceed the amount required to fill the voids in the crushed granite, and so long as the cemeting material can surround all the particles.

Voids.—A fairly accurate method of finding the percentage of voids in the granite chippings is to take a quantity of the aggregate, place it in a vessel of known capacity, shake down and level and add water from a vessel of known capacity. The amount of water used after taking into account that taken up by the aggregate will give the volume of the voids, and from this the percentage can be ascertained. The author has carried out several tests to ascertain the percentage of voids in granite chippings, such as is used for the manufacture of artificial stone paving, and finds that a fair figure to take is 45 to 50 per cent. by volume. As the chippings were measured loose the percentage of voids would be less in tamped or machine-made concrete.

Types of Stone.—The manufacture may be conveniently divided into three heads:—

1. Machine made.
2. Hand made.
3. Partly machine and partly hand made.

Apparatus Used.—The apparatus used in the manufacture of machine-made slabs consists of automatic appliances for the accurate measuring of the various constituents, mixing machinery, moulds, and presses.

There is no doubt that an accurate measuring of the constituents is essential if one is to get the best results, and from the tests carried out by the author this becomes very apparent by reason of the varying specific gravity of the concrete cubes obtained from the same makers. This may, of course, be due partly to the method of mixing adopted, but even with careful mixing the specific gravity of cubes from the same slabs do not agree. As far as possible it is advisable to remove the human equation from this part of the manufacture of paving stones, and therefore it is apparent that machine mixing is to be preferred, although mixing by hand will have its adherents. Some companies making stone by hand use wood moulds, whilst others use those made of steel. The former are cheaper in first cost, but more costly and troublesome to maintain, as they become ragged at the edges and consequently affect the arrises of the manufactured stone. Steel moulds on the other hand give sharp arrises to the stones and are practically permanent and indestructible. In machine-made slabs the wet concrete is filled into the moulds or mould forming part of the machine, a loose, but closely fitting and perfectly true metal plate is first placed in the mould, this mould is then filled with concrete which is levelled and is consolidated by means of a ram which commences with a pressure of 500 lb. per square inch and is increased by

intensifying to about 3,500 lb. per square inch, when this operation is completed the slab and loose plate is forced out of the mould and taken to the silicating tanks, or indurating tanks, or placed in drying-sheds to mature, some firms adopting the method of keeping the slabs damp in the sheds by watering them occasionally. It is claimed that a machine-made slab is more dense and durable than a hand-made slab. When the slab is made by hand the wet concrete is placed in the mould and is "tamped" thoroughly to remove all air holes as far as possible, some firms using shaking machines to attain the same object.

Machine-made versus Hand-made Slabs.—So far as density is concerned, it appears on the face that machine-made slabs should be heavier than hand-made slabs; but this does not occur in practice to a very noticeable extent. The author has had slabs made from the same aggregate in the same proportions both by machinery and by hand, and he finds that, in some cases, the hand-made slab has been the heavier of the two. So far as the wearing qualities are concerned, the tests given later on in this paper speak for themselves.

Absorption of Water.—To test the absorption of hand-made against machine-made slabs, the author had some bars of concrete made 24 in. long by 2 in. wide and 2 in. deep, and after three months he found that the hand-made slabs contained about 6 per cent. of moisture against 4¼ per cent. in the machine-made slabs. After they had been dried and weighed the bars were steeped in water for a period of eighteen hours and then weighed again, and it was found that the hand-made slabs had absorbed slightly less moisture than they originally contained, whereas the machine-made slabs had absorbed slightly more, but the difference was so slight in the former as to be hardly noticeable, whereas in the latter the percentage was much greater.

Breaking Strength.—So far as this is concerned, the hand-made slabs were in many instances found to be quite as strong as machine-made slabs.

From this it would appear that properly made hand-made slabs are as good as machine-made slabs.

Density of Slabs.—The average weight of a cubic foot of concrete composed of three of granite chippings to one of cement may be taken to be 150 lb. and a stone at this weight will represent a specific gravity of 2·4; of this the moisture may be taken to be 5 per cent., bringing down the specific gravity of the cement and concrete to 2·28. In the above proportions the granite chippings will represent a specific gravity of 1·72, leaving the voids as 35 per cent. to 42 per cent., according to the weight of the granite used for the chippings.

Durability.—There is no doubt that the best test for durability is the actual wear in the stone when laid in a thoroughfare subjected to atmospheric influences. A considerable number of years have now elapsed since some of the artificial stones first came into use, and members of the Association have had ample opportunities of gauging the wear of such stones under ordinary cone ditions. It is, however, difficult to compar one stone with another when laid as footway paving, as they cannot be subjected to exactly similar conditions. The author has therefore tested some scores of samples of stones for their wearing qualities. The stones tested were as follows: Victoria, Aberdeen, Adamant, Empire, Non-slip, Granolite, Imperial, Thames, Excelsior, Croft, Cliffe Hill, Alexandra, Atlas, and a paving made from destructor clinker.

The manufacturers were good enough to have the cubes cut out from the acutual slabs, these cubes being as near as possible 2 in. by 2 in. by 2 in. For wearing properties the author adopted the "rubbing test" as follows:—

A small vertical gas-engine of 2½-horse-power was requisitioned for the purpose, and an emery wheel attached to an extension of the fly-wheel axle. The cubes were held in a wooden frame on the face of the emery wheel by means of an iron bar pivoted to a rigid wooden frame, extending over the stone under test with a weight depending from the further end.

By this means an equal pressure was applied throughout the tests to all the stones and the human equation eliminated. Each test consisted in allowing the engine to run for fifteen minutes at 220 revolutions per minute. The result of these tests proved that the majority of the stones on the market showed comparatively little wear, the hand-made comparing very well with the machine-made slabs. . . .

Maturity.—It goes without saying that a slab, to be suitable for footway paving, should be "mature," and the general rule is to insist upon a guarantee that the slabs shall be twelve months old before delivery on the works. It is difficult, of course, after the slabs have been delivered on the works to subject all to tests to prove their maturity.

Of late years, no doubt owing to the large number of manufacturers, a specified breaking stress has been applied and required by municipal engineers, and manufacturers are now alive to the fact, and in many instances the test is applied by the manufacturers at their own works, and a certificate issued with all consignments; but the majority of municipal engineers like to see the test applied themselves. The best manufacturers are only too willing to submit their stones to any reasonable breaking test in the presence of the engineer, as it is to their interest entirely to supply a stone which will meet with approval. The result has been that several tests have been suggested and adopted by different municipal engineers, but the author thinks it will be agreed that a general test should be adopted, so that manufacturers may know what to expect, and so that all manufacturers may be placed on the same and equal footing.

The usual thing is to select a certain number of stones out of a specified consignment, and if any or a certain proportion of these stones break under the test to be applied, the consignment is rejected.

Owing to the uncertain mixing and manufacture of slabs it is therefore advisable to adopt a reasonable breaking test, and not one which might possibly be reached in exceptional cases.

In order to ascertain the strength of a beam as compared with any load it may have to carry it is necessary to ascertain the nature and extent of the external forces at work tending to break a beam across, together with the internal forces which are resisting this tendency to rupture.

It is a well-known fact that in timber beams the upper half is in compression and the lower half in tension, and although the constituents of concrete are granular and not fibrous, it will be assumed that similar strains are set up.

When a beam is loaded uniformly the bending moment, graphically, takes the form of a parabola, the greatest moment being at the centre, and is represented by $\frac{Wl}{8}$, where W is the total load and l the span. When the load is concentrated at the centre the bending moment, graphically, takes the form of a triangle, and the formula becomes $\frac{Wl}{4}$; hence a beam loaded uniformly will bear twice the load as when the load is central. There are many degrees between each of these extremes, and the results obtained by various manufacturers and municipal engineers may be, and no doubt are, due to the fact that the loads are not applied centrally; this could be obviated if the tests were reduced to an equivalent central load, or, better still, if the central load was generally adopted. The most severe breaking load that can be applied is therefore to concentrate the load at the centre of the slab. The load should be applied on as small an area as possible, otherwise it will take somewhat the form of a partially distributed load. If the load could be applied on a knife edge across the centre of the stone, it would be all that could be desired, but as the general rule is to use slabs as the load, it becomes necessary to apply it on a flat surface. Manufacturers could no doubt use some form of hydraulic apparatus in which the load could be applied on a knife edge and applied gradually, or the load could be applied by means of weight sliding on a long lever arm; by either of these means the actual breaking load or the test load could be applied without jerks and applied at the proper place. We have, however, to deal with the tests as they exist. Experience has shown that 4 in. is about the narrowest width that can be used under these conditions. It is therefore suggested that when slabs are used as the load the slab under test should rest on knife edges, across the width of the slab, placed 11 in. on either side of the centre of the slab, and the load applied, stone by stone, as carefully as possible, to prevent jarring. A good method is to use slabs 2 ft. 6 in. long, as the load, placed with their long axes alternately across the width and length of the slab under test, thus giving a "hand-hold" during loading.

The resistance afforded by the internal structure of the slab is given by a number of closely adhering grains. It is difficult to state the actual position of the neutral axis in any particular slab, but if it is taken along the centre of the depth, the cemented grains below the centre line is subject to tension, and the grains above the centre line is subject to compression.

On this assumption the grains on the lower face would be subject to the greatest tensile stress, but the area subjected to tension will depend upon the position of the neutral axis.

Simple concrete will fail in tension long before its failure takes place by compression, hence this stress is generally taken.

From extended experiments upon both slabs and test bars the author finds that the modulus of rupture, or the "tensile strength per unit of area of extreme fibre" of concrete as used in paving slabs, may be taken as from 770 lb. per square inch to 1,155 lb. per square inch, and at these figures the concentrated breaking loads should be from 20 cwt. to 30 cwt.

Specification.—After tests spreading over several years, the author has adopted the following specification:—

Artificial Stone Paving.—The paving to be obtained from an approved manufacturer in stones not less than 4 ft. in superficial area, unless otherwise sanctioned, and to be 2 in. thick.

The manufacturer or manufacturers must give a written guarantee to the contractor and the surveyor that the stones proposed to be supplied by him or them have been in stock at least twelve months before delivery upon the works. The stone to be made of granite chippings and Portland cement, well mixed together. Either machine-made or hand-made slabs will be accepted. The stones will be required to have both top and bottom faces equal in character and finish, the stones to be out of winding, the edges and arrises to be true and clean. When the stones are delivered on the job the surveyor will select a number of stones in the proportion of four slabs for every street, or for every 400 yds. supplied, whichever is the smaller, and a test will be applied in the following manner:—

The stone to be tested will rest on knife edges (placed 11 in. on either side of the centre of the longest dimension of the stone) and a piece of 4-in. by 3-in. timber laid flat across the centre of the stone at its narrowest dimension, and the load applied by means of similar slabs piled one on the other.

If the stones do not comply with the requirements above specified, or (on testing) any or either of the stones break at less than

20 cwt., the whole consignment will be rejected, and must be removed from the works on notice from the surveyor. The contractor must provide in his price for the necessary assistance for testing, and also for any stones broken during the tests. . .

Archæological Societies.

MEETING OF GLASGOW AND NEWCASTLE ARCHÆOLOGISTS.

On Friday and Saturday last week the members of the Newcastle Society of Antiquaries held a country meeting on the line of the Roman Wall, in conjunction with the members of the Glasgow Archæological Society. The representatives of the Glasgow Society arrived in Newcastle on Thursday evening. The party included Dr. George Neilson, Procurator-Fiscal of Glasgow (President), and Sir Archibald Lawrie. On their arrival at the Central Station, Newcastle, they were met by Mr. Robert Blair and Mr. R. Oliver Heslop, the Honorary Secretaries of the Newcastle Society, and the Rev. C. E. Adamson, who conducted them to the Castle, the headquarters of the Newcastle Society. The party was conducted over the Castle and the Black Gate by Mr. Heslop, and tea was afterwards served in the Castle. The party left the city early on Friday morning for Hexham, whence they drove to Chollerford. After visiting the remains of the Roman bridge across the Tyne at Chollerford, the station of Cilurnum, and the museum the party partook of lunch, after which the drive along the line of the Roman Wall was resumed to as far as Housesteads. The Housesteads Mile Castle inspected, the party made their way back to Hexham by way of Bardon Mill and Chesterholm. On Saturday a visit was made to the Roman remains now being excavated at Corstopitum. The party were conducted over the excavations by Professor Haverfield, of Oxford; Mr. R. H. Foster, who is in charge; and Mr. W. H. Knowles, of Newcastle, who assisted with explanations. Professor Haverfield went briefly over the ground covered during the four years, and said it was one of the most important sites hitherto found in Roman Britain, and the discoveries made were of unparalleled importance. He dealt with the recent discovery of a trough worn round the edges with semicircles. There was a dispute as to what had done this, knives, buckets, and the necks of cows being given as agencies. He was inclined to favour buckets. Another trough had been found at the back of the town, and from it they were trying to trace the watercourse which must have brought water down from the hill behind. Turning to the big building discovered at the end of last season, Professor Haverfield pointed out the masonry of which it was composed, remarking that it was better masonry and more solid than he had seen anywhere else in Roman Britain, even in Bath. They had not yet been able to fix its use, although apparently the northern part had not been finished. The building was similar to a forum, but had not the usual corridors, and, in fact, did not exactly resemble any forum, basilica, or prætorium known. From its character, however, he deduced that it was such a building that no one but a State, and probably only the war office of a State, would have put it up. This year, he added, they had not been able to open up very much ground, and the buildings found were not of first importance. They included a large hypocaust, with two apses, another granary, and several other buildings of the same character. Certain articles found, however, had been of the greatest importance, these including pottery which dated back to the Ist century A.D., the time of Agricola. The visitors subsequently went over the site, and afterwards inspected in the museum the pottery referred to and other interesting items. One of these was a mould, from which a cast has been taken, which is believed to represent a local god. Two finely preserved statuettes of Mercury and Cybele were also shown, and a piece of chain mail made of bronze and iron, the former being regarded as conclusive evidence of its Roman origin.

YORKSHIRE ARCHÆOLOGICAL SOCIETY.

On Wednesday, the 18th inst., the members of the Yorkshire Archæological Society paid a visit to some of the places of interest within that part of Yorkshire known of old as the Forest of Bowland. Driving from Chatburn Station, the party traversed a succession of country lanes to Sawley Abbey. The ruins of Sawley are not imposing; little beyond the ground plan and a few shapeless walls are now to be traced. The site was roughly cleared some sixty years ago, but it is now quite overgrown, and Mr. Sydney D. Kitson, F.R.I.B.A., who explained the history and the relics to the party, took occasion to suggest the desirability of a complete investigation. So much had, he pointed out, been learnt in recent years with regard to the plan of a Cistercian abbey that a fresh clearance of the site would assuredly be productive, and it need not be costly. The abbey was a minor star in the great group of Cistercian abbeys which form the antiquarian glory of the county. It was founded by a Yorkshireman, William de Percy, Lord of Topcliffe and Spofforth, whose relative from his castle at Mulgrave had reinstated the Benedictine Abbey of Whitby, and later, when further endowments were required, they came from Percy's daughter and her tenants the Vavasours, from land at Tadcaster and at Hunslet. Tracing in detail the history of the place, Mr. Kitson showed that its record was one of almost continuous poverty, for the place did not secure rich gifts such as those which went to Kirkstall and Fountains, and the monks themselves were dissatisfied with the site. Under Mr. Kitson's guidance the ground plan, which follows the usual type and has many interesting parallels with Kirkstall and Fountains, was studied as thoroughly as the rain would permit. Lunch was then taken at the Spread Eagle Hotel, Sawley, and subsequently the party crossed the beautiful valley of the Ribble and drove forward to the ancient hall of Bashall, near the little hamlet of Bashall Eaves. Their way took them within site of the hall of Waddington, where, during the Wars of the Roses, King Henry VI. lay for a while concealed. Without, however, stopping to inspect the building, the party drove forward to Bashall, where they were received by Colonel J. W. R. Parker, F.S.A., who gave some historical notes on the families who had owned the building. The chief interest of the building lay, however, in the fact that it afforded exceptionally interesting relics of early domestic architecture. The hall itself is of early Tudor work, and there is in the rear a large building, with a picturesque wooden gallery, which, according to tradition, was the "barrack" of the retainers of the Talbots. This is of still greater antiquity than the hall. Mr. Kitson, who spoke on the architectural interests of the place, indeed, attributed it to the latter part of the XVth century. Speaking with special reference to the hall, Mr. Kitson said that house-building in the early Tudor period was of an essentially English type. Sawley Abbey, which had just been visited, traced its origin to a foreign type and a Burgundian plan, but Bashall was a home product such as could neither have been originated nor imitated by foreign contemporaries. The fortified house, or castle, which until the end of the Wars of the Roses was a necessity in England, was a piece of military rather than of domestic architecture, and as such was naturally governed by the international rules of war, just as church architecture was governed by the ritual which obtained throughout Christendom. But after the Wars of the Roses the fortified house fell into disuse, and the English house was evolved. Relieved from the necessity of having mere slits for the admission of light the house designers revelled in large and many mullioned windows. After leaving Bashall the members were received by Colonel Parker in his historic home of Browsholme. Colonel Parker, in a short address, told some of the historical associations of the spot. A short address was also given by Mr. Kitson, who showed that Browsholme Hall had been subjected to so many alterations as to be a veritable architectural puzzle. Subsequently the party were entertained to afternoon tea by Colonel and Mrs. Parker, and before they returned to their conveyances for the homeward journey inspection was made of the many objects of interest which are preserved in the hall.—*Yorkshire Observer.*

Competition News.

STOKE-ON-TRENT TOWN HALL EXTENSION SCHEME.

We mentioned last week the result of this competition. We are now enabled to give the names of the authors of the designs placed first and third by the assessor but disqualified by the Committee. The authors of the design placed first were Messrs. Garratt & Simister, Norwich Union-chambers, Congreve-street, Birmingham; the third was by Mr. William Heywood, of the same address.

WELSH NATIONAL MUSEUM.

Dr. W. E. Hoyle, Director of the National Museum of Wales, has issued a list of conditions and instructions to architects who intend to compete for the national buildings to be reared in Cathays Park, Cardiff. He states that the Council of the National Museum is prepared to receive designs for the new museum at a cost for the completed building of 250,000*l.*, inclusive of carving, but exclusive of decorative sculpture, that may be presented later, for which positions should be provided by the architect. It is thought that about one-third of the building will be erected in the first instance, and this portion will probably have to house temporarily all the six departments. From the position of the site on the east side of the City Hall and the relation of the Law Courts, on its west side, to that building as a centre, it is thought desirable that externally the museum building should be designed in harmony with these buildings, that, so far as possible, it may be in sympathy with the general scheme adopted. All elevations must be executed in best Portland stone. The competition is open to all architects, and competitors are invited to make every provision they consider necessary for such an institution, whether such provision is included in the schedule and other papers or not. The designs will be submitted to the assessors, Sir Aston Webb, R.A., Mr. John James Burnet, A.R.S.A., and Mr. Edwin T. Hall, F.R.I.B.A., who will advise the Committee which is, in their opinion, the design most suitable for adoption, and unless some adequate reason exists to the contrary (of which the Council, with the advice of their assessors, shall be sole judge), the author of the said design will be appointed architect for the museum. The author of the design placed second by the assessors will receive a premium of 200*l.*, that placed third 150*l.*, and that placed fourth 100*l.*

POLYTECHNIC INSTITUTE, ARGENTINE REPUBLIC.

With reference to the notices on p. 312 of the *Board of Trade Journal* of February 18, and p. 429 of the issue of May 27, on the subject of an announcement inviting plans and offers for the construction of the Polyclinic Institute of José de San Martin, H.M. Consul at Buenos Ayres (Mr. A. C. Ross, C.B.), has forwarded a pamphlet containing the terms and conditions of the competition. The plans must be submitted before December 10. The pamphlet referred to may be seen by British firms interested on application at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall-street, London, E.C.

BOOKS RECEIVED.

THE THEORY OF STRUCTURES. By R. J. Woods, M.E., M.Inst.C.E., with 157 illustrations. Pp. 276. (London: Edward Arnold. 10s. 6d. net.)

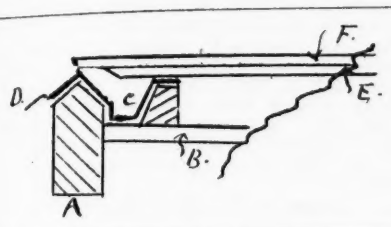
REINFORCED CONCRETE IN EUROPE. By A. Ladd Colby. Published by the Chemical Publishing Company, Easton, Pa. (London: Williams & Norgate. Pp. 260.)

THE LEAD AND ZINC PIGMENTS. By Clifford Dyer Holley, M.S., Ph.D. Pp. 340. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd. 12s. 6d. net.)

Correspondence.

SLATING.

SIR,—Replying to "Zax," I beg to say that I have executed high-pitched roofs and have not used soakers, but have provided secret gutters under the slates parallel with the hips; and before slating, the hips have been covered with lead and dropped into the gutter as shown,



lead indicated by thick line in the accompanying sketch. These gutters are on both sides of the hips, and made to discharge into the ordinary gutter. This is a very satisfactory method—A, hip; B, roof hoarding; C, gutter; D, lead; E, slate batten; F, slates.

ARGUS.

SIR,—If my advice to "Zax" does not come too late to be of service, may I tell him that in my experience slate and a half at the hips, or slates of such width as will allow each when cut to be secured by two nails, will produce a mitred hip perfect in form and perfectly secure against weather if properly executed? The employment of any "putty" or mastic bed will not only fail permanently to hold in its place a small triangular slate secure with one nail, but it will cockle up the hip, rendering the mitreing untrue, and its appearance unsightly. Soakers, I may add, are quite unnecessary.

C. J. T.

LONDON AND DISTRICT BOROUGH COUNCILS.

Brentford.—Dr. Henry Bott, the Medical Officer of Health, writes, in his annual report, that several blocks of insanitary property were reported upon during 1908 as being unfit for human habitation, and closing orders were made. Something accordingly had been done, he says, to remove a black spot from Brentford, but very much more will be required before the town can be modernised. There are scores of back-to-back houses very old and dilapidated which ought to be closed; some are built chiefly of wood, which are extremely dangerous in case of fire. The difficulty he found in dealing with any of these properties is the organised delay which is adopted. After he had inspected the houses, a letter is written to the owner, who promises to do everything required. He is so leisurely in doing this that he is pressed to make a beginning. Then he sends in a specification of what he thinks is necessary, which is always quite inadequate, and so the ball is kept rolling. Meanwhile it is hoped that this business will occupy the attention of the Medical Officer, and that he shall not worry the owners of other property as bad as this one. Although progress is thus slower than could be wished, Dr. Bott says he is determined to continue his efforts, and in the end overcome the passive resisters.

Greenwich.—Dr. E. G. Annis, the Medical Officer of Health, in his annual report, which has just been issued, makes the following remarks upon the nuisances arising from the London County Council sewers:—"This department still continues to receive complaints as to offensive smells emanating from the London County Council's main sewer as it passes through the borough. Communications have frequently passed between the two authorities. Conferences between the two authorities have been held, various promises have been made and withdrawn. Much trouble has been occasioned to this department in obtaining sites for the erection of ventilating shafts, both free and for a nominal charge, but up to the present nothing whatever has been done to abate this nuisance. Undoubtedly it must with truth be said that as far as nuisances of this sort are concerned in this borough, the London County Council, by means of their main sewerage system, are the most serious offenders. The following is an illustration of the peculiar methods at times adopted by the London County Council. This Council has had a sewer passing along Wellington-road, Charlton, for some time, and we have never received complaints with respect to any offensive smells emanating from the surface manholes of this sewer until the warm weather in the early part of the summer, when serious complaints began to be made by residents and others from this neighbourhood. The offensive emanations were readily traced to an open surface manhole in the roadway, and as the London County Council had recently taken into use their new outfall sewer, which crosses this road, having at this spot a surface ventilator in the roadway, it was thought that the smell came from the new County Council outfall sewer. I immediately wrote to the County Council officials drawing their attention to these complaints, when they very quickly replied that the smells emanated from our local sewer grating, and not from their surface ventilator, which was sealed up. This being such an unusual condition of affairs for our local sewer, an investigation was made, and it seems at the time the new outfall sewer, passing along the Wellington-road, Charlton, below this Council's sewer, which passes along the road, was constructed, a vertical connexion some 22 ft. long was made from the lower new outfall sewer up into the local Wellington-road sewer, this connexion being made entirely against the wish of this Council and their officers; thus this vertical shaft was passing a very objectionable odour from the County Council's new outfall sewer up into our local sewer, thence through our local sewer grating into the roadway; accordingly, although the smells evidently arose from the new outfall sewer, yet they emanated from our surface ventilator, and the County Council's reply to our complaint would seem to indicate that they would wish to make this Council responsible for the objectionable smells complained of. Needless to say, steps were immediately taken to satisfactorily deal with this vertical shaft. Unfortunately, it has been thought that this Council could take no action short of an action in the High Court, which doubtless would have to go to the highest Court, and thus occasion considerable expenditure; but during the year the opinion of Mr. A. MacMorran, M.A., K.C., has been taken, and as this indicates there may be another method for taking action, definite evidence upon which to base the case is now being collected. I certainly think it is a great pity that the London County Council, who profess to have the public health and the good of the public generally so much at heart, have not seen their way to do something, for even although it might turn out to be ineffectual, still the fact of having attempted something would show their willingness to act up to their profession in the matter, especially when measures, which it is thought would prove, at any rate, helpful could be adopted at a very trifling expense. It is with much regret that I have to place on record the fact that the large amounts of money expended by the County Council in providing the relief sewers through this district have not been entirely effectual. At times of sudden great rainfall, doubtless combined with certain states of the tide, we still find that the water from the sewers backs up and discharges into the yards and premises of the low-lying parts of this borough."

Ilford.—Dr. C. F. Stovin, the Medical Officer of Health, refers in his annual report to the extreme difficulty of obtaining suitable tips for the disposal of house refuse, and says the erection of a destructor is a matter of considerable urgency. During 1908 a new sewer was laid down along Fencepiece-road. This takes the drainage from several cottages that were formerly drained into cesspools, with overflows into ditches. In August there was a violent explosion at the sewage works, involving the destruction of one septic tank and some drainage to the neighbouring ones. Mr. A. J. Martin, M.Inst.C.E., was called in by the Council to report as to the cause, and gave as his opinion that it was due to the lighting back of the inflammable gases conveyed from the tanks to the boiler. He also made various suggestions to prevent a similar recurrence. The Wanstead Urban District Council's sewage works adjoin the boundary of this district in one portion, and during 1907 there were complaints of a nuisance arising from these works. During 1908 an enlargement of their contact-bed system was carried out, and, if properly managed, one would hope, Dr. Stovin writes, that there will be no recurrence of any trouble from these works.

Wimbledon.—The report of Mr. Henry Johnson, the Chief Sanitary Inspector, states that during the year the work of the department had been carried on in conjunction with property owners, agents, and builders with almost perfect harmony. Proof of this, Mr. Johnson says, was afforded by the very rare occasions on which legal proceedings had to be resorted to; 774 notices in respect of 1,038 houses were served in connexion with the abatement of nuisances under the Public Health Acts, and the remedying of contraventions of the by-laws and other statutes which are under the jurisdiction of an inspector. It was pleasing to note that it was only found necessary to serve 158 statutory notices respecting 189 houses at the instances of the sanitary authority, the experience being that, in the majority of cases owners of property are willing to carry out work when a request in the form of an ordinary letter is made. At 102 houses the drainage systems and sanitary fittings were entirely reconstructed, and repairs, in most instances of an extensive nature, were executed at sixty other houses. Every opportunity was taken to obtain, where possible, the covering with impervious material of the spaces round the back walls of dwellings, especially in the poorer streets. During the twelve months, this was carried out at 118 houses.

Woolwich.—Dr. Sidney Davies, the Medical Officer of Health, writes, in his annual report, that the fact that 3,113 notices were served under the Public Health Act, and that it was only necessary to take out a summons in one case to compel compliance with the notice, is evidence that the Public Health Department attains good results with a minimum of friction.

PROJECTED NEW BUILDINGS IN THE PROVINCES.

ADDINGHAM (Skipton).—School (4,000*l.*); architect, Mr. J. V. Edwards, Shire Hall, Wakefield.

Aintree.—Printing works (14,000*l.*); builder, Mr. H. Kelly, Walton, Liverpool.

Belfast.—Block of offices, Clyde Shipping Company; architect, Messrs. Graeme Watt & Tullock, 7A, Victoria-street, Belfast.

Birkenhead.—School, Brassey-street; builder, Mr. S. Rothwell, Birkenhead.

Boscombe.—Library; architect, Mr. C. Miles, Observer-chambers, Albert-road, Bournemouth; builder, Mr. F. Rigg, Portman-road, Bournemouth. Additions, Royal Hospital; architect, Mr. G. A. B. Livesay, Fair Vale-chambers, Christchurch-road, Bournemouth.

Bowburn.—Church; architect, Mr. J. W. Hays, Wingate.

Brimsdown.—Warehouse; architects, Messrs. C. Heathcote & Son, 110, Cannon-street, E.C.

Builth (Wells).—School (6,000*l.*); architect, Mr. C. W. Best, County Offices, Brecon.

Carrickmacross.—Church; architect, Mr. J. J. McDonnell, 27, Chichester-street, Belfast.

Coxledge.—Institute (2,000*l.*); architect, Mr. H. Gibson, Camden-street, North Shields.

Darlington.—Offices; architect, Mr. Bell, North-Eastern Railway Company, York.

Dewsbury.—Nurses' Home (6,000*l.*); Clerk to Guardians, Dewsbury.

Dover.—School; Mr. Hawke, Borough Engineer, Dover.

Earby.—Eighteen houses, Lower Croft; architects, Messrs. Warmwell & Sons, Earby.

Exeter.—Concert hall; architect, Mr. J. Cricker, Queen-street, Exeter. West of England Eye Infirmary (3,000*l.*); builders, Messrs. Stephens, Gore-street, Exeter.

Fenton (Staffs).—Fifteen houses, King-street, for Mr. James Shenton. Mission church, for Methodist New Connexion, Queen-street, Fenton.

Fishponds.—Church, St. John's; architect, Mr. E. H. Lingen Barker, Orchard-street, Bristol.

Forglen.—Extensions, public school; architects, Mr. W. L. Duncan, Hallhill House, Turiff, N.B.

Gateshead.—Hall (1,700*l.*); architect, Mr. P. Steinlet, Camden-street, North Shields.

Glasgow. — Laundry buildings (3,000*l.*); Messrs. Baikie & Hogg; architect, Mr. J. S. Hogg, 26, Frederick-street, Glasgow.

Grantham. — Secondary school (7,000*l.*); builders, Messrs. Corah & Sons, Loughborough.

Hanley Castle.—Power-station; architect, Mr. H. Berkeley, Hanley Castle, Banbury.

Helsby.—School (3,000*l.*); builders, Messrs. J. G. Davies & Co., Frodsham.

Hereford.—Additions, St. Nicholas Church; builder, Mr. E. W. Wilk, Went End Works, Hereford. Extensions, Bluecoat School; architect, Mr. W. Robinson, King-street, Hereford.

Heswall.—Lloyd's Bank premises; architects, Messrs. Grayson & Ould, James-street, Liverpool.

Launceston. — Restoration, St. Mary's Church; architect, Mr. E. H. Sedding, Plymouth.

Lochgarron.—Manse (1,750*l.*); architect, Mr. W. McKenzie, County-buildings, Dingwall, N.B.

Long Benton.—Twenty cottages; architect, Mr. H. Gibson, Camden-street, North Shields.

Longton.—Church and school; Vicar of St. John's, Longton.

Merside.—School; Mr. J. Taylor, County Surveyor, The Castle, Winchester.

Millbrook.—Restoration, old church; architects, Messrs. Cancellor & Hill, Jewry-street, Winchester.

Monton.—Secondary school (9,000*l.*); architect, Mr. H. Littler, Ribblesdale-place, Preston.

Newport (Mon.).—The Town Council has passed the following plans:—Three houses, Bryngwyn-road, and two houses, Methuen-road, Messrs. Habershon, Fawckner, & Co.; two shops, Chepstow-road, Mr. H. Budgen; additions to Sunny Bank, Dewsland-park, for Mr. W. J. Cookes, Sunny Bank; three houses, Queen-street, Mr. G. J. Stemp; additions to workshop, Ross-street, Mr. E. M. Linton. The following plans have been lodged:—Mr. W. Gardner, warehouse, Watchhouse-parade; Messrs. W. G. Hitchcox & Co., warehouse and alterations at 35, Llanarth-street; Mr. H. J. Griggs, billiard-room at Maindee Hotel, Chepstow-road; Mr. A. Swash, two houses, Oakfield-road; Messrs. E. Page & Lister, skating-rink, Stow-hill.

Oxford. — Residence (8,000*l.*); architects, Messsrs. Tollitt & Lee, St. Aldates-street, Oxford.

Romford (Essex).—Railway station buildings, Squirrells Heath; engineer, Great Eastern Railway Company, Liverpool-street, E.C.

Sabden.—Baptist chapel (6,000*l.*); architect, Mr. F. Parkinson, 9, Richmond-terrace, Blackburn.

Stanley (Perth).—School (2,000*l.*); architect, Mr. J. Duncan, Stanley.

Swanage.—School (1,700*l.*); builders, Messrs. H. & J. Hardy, Swanage.

Usk.—School (3,500*l.*); builder, Mr. H. Rees, Pontllanfraith.

Usworth.—Fifty houses (10,000*l.*); architect, Mr. S. Spain, Fawcett-street, Sunderland; builders, Messrs. Clark & Son, Ryhope.

Walkden.—Public offices; architect, Mr. J. T. Profitt, 9, Longley-road, Walkden.

Walsoken.—School; architect, Mr. H. Green, Castle Meadow, Norwich.

West Derby (Liverpool).—Lecture hall (1,500*l.*); builder, Mr. S. Webster, Bootle.

Weybridge. — Residence, Oatland Park (1,400*l.*); builder, Mr. H. J. Nicholson, Weybridge.

Whiteminster.—Residence; architect, Mr. E. Pryer, 15, Clarence-street, Gloucester.

ST. PANCRAS ELECTRICITY WORKS.

THE following paper, by Mr. S. W. Baynes, Chief Electrical Engineer, St. Pancras, was presented at the annual meeting of the Association of Municipal and County Engineers, held at the end of June, in the Town Hall, St. Pancras:—

The supply described herein was the first municipal undertaking established in the metropolis, commencing to supply in November, 1891. The original pressure at the consumers' terminals was 110 volts—three-wire system.

The design of the original scheme intended that there should be four generating-stations, the first being situate at Stanhope-street, off the Euston-road.

The original plant at this station consisted of eleven 80 kilowatt Willans triple-expansion high-speed engines, fed with steam from Babcock & Wilcox boilers, at 185 lb. working pressure. Some of these small engines have now been replaced by four, each 500 kilowatts, Willans & Robinson three-crank triple-expansion engines, coupled to Siemens continuous-sets.

In 1895 the second generating-station was started in conjunction with the dust destructor at King's-road, Camden Town. At the same time a five-wire system, distributing current at 110 volts, was inaugurated in connexion with this new station; but at a little later date the whole of the system was changed to 220-volts pressure at the consumers' terminals and 440 volts on the "outers," using three-wire distribution throughout. A few 110-volt consumers still remain, and these are supplied from the original station. This was the first undertaking in London to double the pressure of supply for lighting at the consumers' terminals, and so effect considerable economy in the amount expended on mains, only one-fourth the amount of copper being required.

In order to utilise, so far as practicable, the heat for generating steam from the dust destructor, three Lancashire boilers were installed at the low working pressure of 125 lb. per square inch. They were arranged to either use the heat from the dust destructor or to be fed with coal (at times of heavy load) in the usual way.

At a later date, however, it was found that the demands on the station were so considerable that the heat from the dust destructor was no longer of sufficient service, and its use was ultimately discontinued.

As stated, the original scheme contemplated four generating-stations to handle the load of the borough, therefore little or no provision was made for extending either of the two put down.

With the doubling of the pressure at the consumers' terminals and the opening up of two substations (one in the north and one in the southern district, operated with three-phase transmission at fifty periods, 5,200 volts) in July, 1903, the necessity for the further two generating-stations became extinct, and the intention now is to develop the King's-road works into the main generating-station, since its location is favourable to economies, due to easy access to the canal for condensing water and to the railway for obtaining coal, by means of an overhead track, now proposed to be constructed, direct into the bunkers.

It is unfortunate that in the lay-out some sixteen years ago these developments could not have been foreseen, for this station is so hemmed in with adjoining streets and the dust destructor that the only possibilities of extension have been to knock out the sides of the building and extend with a wing on the west and a wing on the east, so that the station as a whole does not present quite the convenient arrangement that it would have done had it been possible to extend in the other direction.

The present plant at the King's-road station consists of:—

One 2,000-kilowatt Willans & Robinson—Dick Kerr turbo alternator (2,800 kilowatts overloaded for three hours).
One 1,000-kilowatt Bruce Peebles motor converter.
One 1,000-kilowatt Parsons turbine coupled to two 500-kilowatt Parsons continuous-current machines.
One 1,000-kilowatt Parsons turbine coupled to two 500-kilowatt Siemens continuous-current machines.
Three Browett Lindley engines of 450 kilowatts each. Two being coupled to three-phase alternators, and the third to a continuous-current machine.
(These three machines are of the Allgemeine construction.)

The original station here consisted of:—

Three 180-kilowatt Belliss & Morcom continuous-current sets.
One 200-kilowatt Peachey continuous-current set.
Two 180-kilowatt Willans continuous-current sets.

All these engines, excepting the two Willans, have been displaced by the two 1,000-kilowatt turbines, bringing the plant up to date, the expenditure being met out of reserve fund.

The five original Lancashire boilers are still in use, with the addition of four water-tube boilers of the Babcock & Wilcox type. A further extension to the boiler-house is in contemplation, for as the works at present stand they are extremely short of boiler power, and therefore unable to handle the full load efficiently in consequence. The present four Babcock boilers are in a temporary boiler-house, where the space is much limited.

All the steam plant exhausts into suitable condensers, and the cooling water is obtained from the canal.

Each of the two substations is equipped with three motor converters of the Allgemeine type and one of Peebles-Lacour construction; the total capacity of each substation being about 1,000 kilowatts.

The whole of the high-tension plant has been in operation six years without the slightest trouble occurring.

There are three feeders running to each substation, and the capacity is so arranged that should one fail the other two can handle the full load by being slightly overloaded.

The total capital expenditure on the plant up to the financial year ended March, 1908, was:—

	£	s.	d.
On mains	235,230	4	6
On machinery	145,920	0	10
The output (units sold) year ended March, 1908	7,617,009	0	0
Revenue (units sold) year ended March, 1908	77,602	7	8
Net profit (units sold) year ended March, 1908	9,454	7	3
Combined capacity of both generating stations	8,280 kilowatts.		

General Building News.

ALL SAINTS' CHURCH, GREAT OAKLEY.

Messrs. Chancellor & Sons, of Ipswich, have been appointed to carry out an enlargement of the parish church, Great Oakley, in Essex. The church had originally a steeple constructed of flint, which, having become ruinous, was rebuilt.

NEW CHURCH, LITHERLAND, LIVERPOOL.

Lord Derby has given a site at the junction of Province and Monfa roads, in the parish of St. Philip, Litherland, for the erection of a memorial church, for which Miss Willox has given 10,000*l.* The plans and designs have been prepared by, it is stated, Mr. J. F. Doyle.

NEW CHURCH, DEVONPORT.

The foundation-stone of St. Chad's Church, Moon-street, Devonport, was recently laid. The new building will seat 350 persons. It will be of brick, with Portland stone dressing. The contract, secured by Pearn Brothers, Plymouth, is for 1,400*l.* The architect is Mr. G. Fellowes-Prynno.

PRIMITIVE METHODIST CHURCH, BROWN LEES.

The erection has been commenced of a new Primitive Methodist Church at Brown Lees. The buildings, the front and side of which are in best red pressed facing bricks, relieved with grey terra-cotta dressings, will cost about 1,600*l.* The buildings comprise the church, minister's vestry, an organ-chamber, and classrooms. The church is ventilated by means of extract air-pump ventilators on the roof, and fresh air inlets, and the classrooms and vestries by air grids; also most of the windows are made to open. The heating will be by low-pressure hot-water system, with radiator. The premises will be erected from the designs of Messrs. Elijah Jones & Jackson, architects, Hanley and Wellington (Salop). The contractor is Mr. Wm. Sherratt, of Smallthorne, Stoke-on-Trent.

GRAMMAR SCHOOL, ASHBOURNE.

The opening has just taken place of the new buildings of Queen Elizabeth's Grammar School, Ashbourne. The buildings were designed by Mr. E. M. Longsdon, Bakewell, and the builder was Mr. W. Thorley, of Noding. They have accommodation for about 130 scholars.

COUNCIL SCHOOLS, WHICKHAM.

New schools have been erected at Whickham by the Durham County Council. The schools, which have been built from the designs of Messrs. Marshall & Tweedy, architects, Newcastle, the contractor being Mr. J. A. M. Henderson, of Jarrow, consist of a mixed department for 400 children, and an infants' department for 200. The classrooms for fifty each are grouped round a central hall, and the infants have four classrooms for fifty each. There is also a cookery school. The cost has worked out at 9*l.* per head.

COUNCIL SCHOOLS, AMMANFORD.

A new Council school has been built at Ammanford. The school is a one-block structure, and will provide accommodation for 500 children. It is built of Ruabon bricks, with terra-cotta dressings, and contains nine classrooms, besides an assembly hall and master's and mistress's rooms, lavatories, porches, store rooms, and corridors. It is fitted throughout with low-pressure heating apparatus, has block floors, and glazed brick dados. The school was designed by Mr. W. Jenkins, of Llandilo, and the contractors were Messrs. Jones Brothers, Tirydail, Ammanford.

SURREY ARCHÆOLOGICAL MUSEUM.

The plans of the addition to the Surrey Archæological Society's Museum at Castle Arch, Guildford, recently came before the Guildford Town Council for approval. The building will be a single hall, one story high, 36 ft. long, by about 24 ft. wide, with main entrance from Quarry-street. The architect is Mr. Ralph Nevill, F.S.A. The building is planned so that the main roof and skylight will not be visible from the road, while the front on the road will be about the same height as the old brick wall, thus avoiding any interference with the view from the road of the present picturesque buildings. In addition to the proposal to pull down a portion of the old wall, room will have to be made at the rear for the accommodation proposed, but the old tiles are to be replaced and a slanting roof retained, so that the appearance of that part from the road will not be altered.

PAROCHIAL HALL, WALLSEND.

Premises suitable for parochial work are being built in connexion with St. Luke's, Wallsend. At present funds will not permit of more than half of the building being erected, and the portion to be carried out comprises the Parish Hall, ladies' parlour, classroom, and a spacious lobby. A kitchen, with cooking accommodation, and lavatory are provided at the rear of the building. The whole of this accommodation is on the ground plan, and the postponed portion of the scheme comprises a small hall to accommodate about 100 persons on the ground floor, and on the first floor a billiard-room for two tables, a large games-room, and lavatories, &c. The architects are Messrs. Frank Caws, Steel, & Caws, Sunderland, while the contractor for the general work is Mr. John Lant, Walker-road, and for the plumbing Mr. T. Hedderly, Wallsend.

COTTAGE HOSPITAL, FELIXSTOWE.

The foundation-stone has been laid of a new Cottage Hospital in Felixstowe. The building will contain on the ground floor matron's sitting-room and doctor's room, hall, two four-bed wards, and two private wards of one bed each, with duty-room between the large wards for proper supervision. There will also be an

operating-theatre, bathrooms, and sanitary conveniences, and store accommodation. On the first floor are nurses' sitting-room, four bedrooms, linen-room, kitchen, scullery, etc. The whole of the ground floor will be covered with the "Perfect" jointless flooring, and all internal and external angles will be rounded. Mr. H. J. Wright has prepared the plans for the work.

NEW BUILDINGS IN ABERDEEN.

The plans of the following new buildings in Aberdeen have been sanctioned:—Alterations in connexion with Ferryhill Foundry, Wellington-road, for Messrs. James Abernethy & Co., ironfounders, per Messrs. Kelly & Nicol, architects: two dwelling-houses on the east side of Abergeldie-terrace at its junction with Abergeldie-road, for Mr. A. Mason, builder, per Messrs. Cameron & Watt, architects; roller skating-rink on the south side of Sinclair-road, for Mr Harry MacMahon, photographer, per Mr. Charles Stephen, architect; alterations and additions in connexion with the Music Hall-buildings, Union-street, for the Aberdeen Music Hall Company, Ltd., per Messrs. Kelly & Nicol, architects; dwelling-house on the north side of Burnett-place, for Mr. A. B. Ferguson, butcher, per Mr. John Rust, architect; alterations in connexion with the premises Nos. 97-103, Union-street, for Messrs. Anderson & Thomson, warehousemen, per Mr. George G. Irvine, architect; alterations in connexion with the property, No. 65, Spital, for Mr. Charles Stewart, butcher, per Mr. J. Cooper, Merkland-road East; alterations in connexion with the premises, Nos. 32-34, Market-street, for Messrs. J. & A. Gibb, warehousemen, per Messrs. Kelly & Nicol, architects; two dwelling-houses on the south side of Devanha-gardens (South), for Mr. D. M'Millan, architect.

PROPOSED SHOP PREMISES, DONCASTER.

The Bridge Committee have recommended to the Council the acceptance of the plans of Mr. Brundell, architect, for the erection of two shops in the new Marshgate and Frenchgate road, on premises now occupied as an eating-house, and one shop between the new Bay Horse and Mr. Burdett's new shop at the foot of the bridge. The estimated cost is about 4,000*l.*

CLUB PREMISES, TUNBRIDGE WELLS.

The members of the Tunbridge Wells Club are now in occupation of new premises in London-road. Mr. Cecil Burns, architect, prepared the designs. Solid Austrian oak has been employed, all of which has been prepared and moulded in Messrs. Beale & Sons' workshops by their own workmen. The accommodation includes a hall, billiard, smoking, dressing, and committee rooms, porters' and steward's room, and a fitted cloakroom. All the sanitary arrangements are by Doulton. Messrs. Beale & Sons have been the builders.

CENTRAL READING-ROOM, DUNDEE.

The work of erecting the new Central Reading-room in Ward-road is expected to be begun immediately. The Joint Committee representative of the Town Council and of the Free Libraries have accepted the following tenders:—Mason work, Mr. D. K. Symington, Dundee; steelwork, Messrs. Fleming Brothers, Glasgow; joiner work, Messrs. John Stewart & Sons, Dundee; painter work, Mr. Allan Boath, Dundee; plumber work, Messrs. J. Farquharson & Son, Dundee; slater work, Mr. Charles Brand, Dundee; glazier work, Messrs. Donald & Smith, Dundee; heating, Mr. D. Keay, Dundee; fittings, Messrs. J. C. Aimer & Sons, Dundee; plaster work, Mr. Alexander Reoch, Dundee; electrical installation, Messrs. Maxwell, Son, & Co., Dundee. The tenders accepted amount to 11,217*l.* The plans of the new building have been prepared by Mr. James Thomson, the City Architect.

TRADE NEWS.

The British Uralite Company (1908), Ltd., have just shipped 200,000 tiles against one order to the Argentine, and 70,000 ft. to a West Indian port. They have arranged their plant to produce 1,000 tiles per hour.

The Children's Home for the Lancaster Union is being warmed and ventilated by means of Shorland's patent Manchester stoves, with descending smoke flues, the same being supplied by Messrs. E. H. Shorland & Brother, of Manchester.

Sanitary and Engineering News.

NEW BRIDGE, EARLS COLNE.

The new ferro-concrete bridge, on the Hennebique system, over the river at Earls Colne, has been tested and opened for traffic. The new bridge, which is 53 ft. in length and 30 ft. wide between the parapets, replaces an old timber bridge, which had done duty for the past 120 years, but unfortunately was not equal to modern requirements, especially as regards heavy locomotive traffic. The bridge has been built from the design and under the superintendence of the County Surveyor, Mr. Percy J. Sheldon, the contractors being the Yorkshire Hennebique Contracting Company, Ltd., of Leeds; and it is not expected that the total cost will exceed 1,200*l.* Mr. W. Buck acted as clerk of the works.

WATER SUPPLY, KEITH.

In consequence of growing necessities for sanitary and trade purposes, a scarcity of water has for two or three years been experienced at Keith, especially in the high-lying parts of the town, and in December, 1906, the Burgh Surveyor, Mr. James Duncan, submitted a report to the Council on the question. Following that, Mr. Charles C. Doig, Elgin, was employed as engineer to report on the best method of increasing the supply, and the Council considered a number of proposals. There was ultimately adopted what is known as the Cairnhill and Whitewell scheme. The source of the new supply, which will be an augmentation to the existing supply, is in a group of springs in the Shenwall district of the parish of Cairnie, about five and a half miles from the burgh, and will add a supplement of 111,000 gallons per day. For the future wants of the town, provision has been made in the scheme for the utilisation of the adjacent Whitewell group of springs, which would add other 70,000 gallons per day to the supply, the plans adopted providing for the linking up of these when necessity demands it. A large roservoir will be constructed on the Cuthil lands above Seafield Park, which will be the centre of distribution for the whole town, and when it becomes necessary to take in the Whitewell springs a low-level resesvoir will also be constructed at Fife-Keith, and the burgh will then be divided into a high and low level system. The cost of the scheme is estimated at between 4,000*l.* and 5,000*l.*, and by the end of September it is expected that the community will be reaping the benefit of the increased supply.

BANGOR WATER SUPPLY.

Bangor's new water supply from the new reservoir, which has been constructed at Ballysallagh, four miles from the town, was formally turned on a few weeks ago. The new reservoir covers an area of about 30 acres, and has a storage capacity of 75,000,000 gallons. A gravitation scheme has been adopted, and the total catchment area extends over about 11,000 acres, but at present the Council are only taking about three-tenths of the available supply. The water is filtered by three sand filters. The scheme was originally planned by the late Mr. L. L. Macassey, and after his death the supervision was entrusted to his son, Mr. V. W. Macassey, with Mr. F. W. M'Cullough, C.E., Engineer to the Belfast City and District Water Commissioners, as consultant; Mr. John Dalzell, C.E., was the resident engineer, and the contract was carried out by Messrs. H. & J. Martin, Ltd., contractors, Belfast. The entire cost of the undertaking was about 30,000*l.*

THE NEW SEWAGE SCHEME FOR LEEDS.

After considering the arguments of counsel and the evidence of experts for a month, Lord Robert Cecil, K.C., M.P., has decided that the Corporation of Leeds shall pay to the Hon. Edward Wood the sum of 149,644*l.* for the land they require at Templenewsam for the purposes of their sewage disposal scheme. There is thus nothing, says the *Yorkshire Post*, now to prevent the city authorities going forward with the work, and putting Leeds in a more favourable position with regard to rivers pollution than she has occupied in the past. It is estimated that the total cost of carrying out the project will be approaching a million and a quarter sterling, and when finished it will be the largest works in the kingdom for treating sewage by the bacteriological method.

Miscellaneous.

INTERNATIONAL HOUSING CONGRESS, MAY, 1910, VIENNA.

In accordance with the decision of the International Permanent Committee, the next International Housing Congress will meet in Vienna. The subjects to be discussed at the congress include:—(1) What conclusions may be drawn from past experiences on the development of parochial polity in the housing question, and in what way may these problems be solved? In answering this question it is to be shown broadly how far, in any particular country, the local authorities have looked into the polity of housing, especially with reference to (*a*) inspection of dwellings; (*b*) inclosing land (extension of the town); (*c*) land polity (acquiring land and keeping it as the property of the community); (*d*) taxation; (*e*) building by the community and the furtherance of co-operative building. The conclusions of the memorandum are to be collected as forming the principles of parochial polity in the housing question. (2) How is the credit for co-operative building to be organised? (*a*) From experiences gained in the country in question it is to be shown how great is the need for credit in co-operative building, *i.e.*, what proportion of the cost of building should the building society provide, and what is the highest rate of interest at which the co-operative building system can afford to borrow; (*b*) what are the sources of credit open to the co-operative building system; (*c*) to whom are the loans made and under what conditions; (*d*) what experience has already been gained with lending societies of various sorts, and what proposals do experts make for organising loans in future. (3) Cottage *versus* block dwellings. The experience is to be reported which has already been gained as to the respective advantages and disadvantages of cottage and of block dwelling from the technical, administrative, and social points of view. Especially is it to be shown whether any difficulties exist in letting cottages on account of the cost of building and repair, and how great is the danger of speculative enterprise if cottages are allowed to pass into private hands. (4) What measures can be recommended for diminishing the cost of erecting cottages? What are the means adopted in the country in question for lessening the cost of building cottages, with reference to (*a*) site; (*b*) construction; (*c*) materials? A distinction to be made between detached cottages and those built in rows or semi-detached. What progress has been made in the last five years in various lands in the conditions of housing? The report on this last question is intended to give a survey of the measures adopted by the Legislature and other authorities for the purpose of improving the housing of the working classes, and of the practical results of co-operative building. The memorandum is to be drawn up, not only with the object of collecting the necessary facts for dealing with the questions in the programme, but is to be the foundation of a reliable, continuous report on the progress of the conditions of the housing problem, which from congress to congress will keep one informed as to the success of improvements in all lands on this particular point. Steps have already been taken to secure expert judges from every country. The congress is expected to last four days, and will close on May 30, 1910. About 300 members are expected to attend.

GARDEN SUBURBAN CITIES, KESWICK AND BRISTOL.

A scheme is formulated for the erection at Keswick of artisans' cottages, to the number of about twenty-five, which will be let at rents of from 10*l.* to 25*l.* per annum. A site has been given by an inhabitant of Rochdale for the undertaking, which will cost about 4,000*l.* At Bristol a company is formed to purchase some 26 acres near Shirehampton Railway-station, where the area of each house plot will be about 340 sq. yds., and the rents will vary from 6*s.* to 10*s.* per week. The ground is within the limits of supply by the Bristol Waterworks Company, and electricity and gas supply is available also.

BIG RUSSIAN CANAL SCHEME.

Prince Scherbator, President of the Moscow Agricultural Society, has made application for a concession to cut a canal between Tsaritzin, on the Volga, to Kalatch, on the Don. To carry out this work he proposes to form a joint stock company, with a capital of 120,000,000r. (12,666,666*l.*). The length of the proposed canal is 80 versts (53 miles). The surface of the Don is nearly 80 ft. higher than that of the Volga, and the canal has to pass over a slight eminence. The great value of the scheme lies in this, that such a canal would join the 6,000 miles of the Volga water system with the Azov and Black Sea.

CHERBOURG STONE.

The British Consul reports that the trade in this stone has shown a slight falling off during the past few years. It had been suggested that this was attributable to German stone exported from the Rhine district taking the place of French material in the United Kingdom; but it turns out on inquiry that at the present time practically all foreign stone is being shipped to the United Kingdom in smaller quantities

than heretofore. British quarries have been particularly active during the last few years, and the preference for materials quarried in the home country is without doubt the reason for this. Cherbourg quartzite is still extensively used, and is in high esteem in France. It is extremely hard and durable, and appears to give an excellent road, whilst its bright and cleanly appearance is sure (the Consul thinks) to maintain for it popularity in the United Kingdom.

BUILDING IN SYRIA.

The annual report of the British Vice-Consul at Tripoli (Syria) says that there is a great demand in Tripoli for Portland cement and hydraulic lime. Building operations have increased to such an extent that the lime-burners cannot meet the demand. Stone for building is also getting very scarce, owing to the emigration of quarrymen, a fact which may be of interest to manufacturers of stone-making machines. The price of stone has increased 50 per cent.

ALTERATIONS TO BURLINGTON HOUSE.

In the House of Commons on Wednesday last week, Mr. Courthope asked the first Commissioner of Works what was the original cost of Burlington House, and what sums had subsequently been expended on structural and other alterations to this building.—Mr. Harcourt: The total cost of the block of buildings known as Burlington House, now occupied by the Royal Academy, the learned societies, and the Civil Service Commission, was 435,212*l*. The Trustees are responsible for the cost of all repairs to the portion occupied by the Royal Academy. There has been no charge on public funds on account of structural alterations to the portion occupied by the learned societies. Various alterations were executed for the London University at a cost of 4,051*l*., including fittings, etc., and upon the transfer of that part of the building to the Civil Service Commission the works of adaptation cost 14,016*l*. Mr. Courthope: Are we to understand that the Government has no financial responsibility for repairs which, judging from the noise, are continually going on?—Mr. Harcourt: I have said what exactly are the repairs for which we are responsible.

BUILDING IN THE UNITED STATES DURING 1908.

A report issued by the U.S. Geological Survey on the clay-working industries, contains statistics as to the cost of buildings erected last year in forty-eight large cities, the total amounting to 110 million pounds in round numbers. Large as it is, this aggregate falls short of the figures for 1907 by 12·73 per cent. The number of permits and the cost of buildings erected in each of the cities are shown in the following table:—

City.	Permits.	Value. Dols.
Atlanta	4,153	4,833,941
Baltimore	2,893	7,554,709
Boston	2,632	11,253,712
Brooklyn	10,769	45,865,240
Buffalo	2,788	6,847,000
Cambridge	425	2,153,070
Chicago	10,627	67,234,800
Cincinnati	3,553	6,428,888
Cleveland	6,674	9,896,869
Columbus	1,698	3,400,273
Dayton	1,193	3,234,280
Denver	3,117	10,098,020
Detroit	3,662	10,682,170
Fall River	399	1,140,927
Grand Rapids	1,064	2,181,759
Hartford	676	3,107,348
Indianapolis	4,013	5,895,928
Jersey City	1,367	4,490,466
Kansas City	792	1,108,472
Kansas City (Mo.)	3,840	10,562,041
Los Angeles	7,371	9,931,377
Louisville	2,909	2,914,141
Lowell	497	1,019,081
Memphis	2,519	3,300,508
Milwaukee	4,169	10,065,669
Minneapolis	5,638	10,093,915
Nashville	4,215	1,969,505
Newark	2,419	7,161,668
New Haven	919	3,091,465
New Orleans	2,457	5,744,311
New York	6,103	117,819,382
Omaha	1,526	4,590,650
Philadelphia	13,363	28,152,265
Pittsburg	4,023	13,136,387
Providence	1,386	4,034,000
Reading	571	497,700
Richmond	1,330	3,169,431
Rochester	1,302	4,975,317
St. Joseph	678	1,717,727
St. Louis	9,119	21,190,369
St. Paul	—	7,625,538
San Francisco	6,729	31,668,341
Scranton	892	2,366,435
Seattle	7,901	13,777,329
Syracuse	1,291	3,317,195
Toledo	1,065	2,081,448
Washington	5,258	10,800,096
Worcester	1,102	2,286,261
Total	163,087	546,467,390

Adding the cost of buildings in New York and Brooklyn, the total for the two cities is 163,684,622 dollars, or about 30 per cent. of the forty-eight cities included in the table. Chicago takes rank after New York, being followed at some distance by San Francisco and Philadelphia. The small city of Seattle exhibits considerable progress, attributed to low prices of material and labour, but we imagine other causes must also be credited with a share of the activity there displayed. Of the permits issued or buildings erected, 38·64 per cent. were for fire-resisting structures and 61·36 per cent. for timber construction, the average cost per building being 9,089 dollars and 2,101 dollars respectively. The following figures represent the number and average cost of brick buildings in three important cities:—

	Number of Buildings.	Cost per Building. Dols.
Chicago	8,208	6,818
Philadelphia	6,778	3,308
New York	1,884	54,705

The largest number of permits for timber buildings was issued at Seattle, the average cost for each of the 7,777 buildings authorised being 1,000 dollars. Los Angeles came next with 4,679 timber buildings, with the average value of 1,383 dollars each. Despite recent experience, San Francisco employed timber largely at the average cost of 3,641 dollars per building. Philadelphia is credited with only forty-five timber buildings, at the average cost of 1,482 dollars each, and Reading takes the place of honour in the respect of having sanctioned no timber buildings during the year.

BRICK CLAY AND THE BUDGET.

Mr. Montgomery asked the Chancellor of the Exchequer whether, in view of the facts that Mr. Justice Buckley, in the case of the Great Western Railway Company *v.* Blades, in 1901, said that within the decision in the case of the Glasgow Corporation *v.* Farie, in 1888, the same clay may be a mineral in one district and not in another, and that both these cases are cited in that of the Great Western Railway Company *v.* the Carpalla United China Clay Company, Ltd., to which the Government has referred for the general meaning of the word mineral, and that no common brick clay has, since 1888, been held to be a mineral for the purpose of receiving compensation under the Railways Clauses Consolidation Act of 1845, he would specifically declare common brick clay not to be a mineral for the purposes of the Finance Bill.—Mr. Lloyd George, in a written reply, stated there is no doubt that brick clay is a mineral in the ordinary acceptation of the term, and it is not proposed in the Finance Bill to make any exception in favour of brick clay. The cases referred to do not affect the general question. They merely decide that, for the purposes of undertakings for which land is acquired under the Railways Clauses Consolidation Act or the Waterworks Clauses Consolidation Act, brick clay forming the surface of the earth is to be treated as land to be acquired under the ordinary provisions of those Acts, and not as minerals, which are subject to special provisions.

THE WHITGIFT HOSPITAL, CROYDON.

A letter has been addressed by the Local Government Board to the Town Clerk of Croydon regarding the proposal to demolish the ancient Whitgift Almshouses in carrying out a street improvement scheme. The communication states that it appears there is a strong desire, in which the Town Council concur, that a poll should be taken before the compulsory powers are applied for which would be requisite to enable the suggested street improvement to be carried out, with the consequent demolition of the almshouses. Hence the Town Council would prefer to proceed by a Bill for a local Act, to the promotion of which the consent of the parochial electors would be necessary, rather than by means of a provisional order under the Public Health Act, 1875, to which no such consent would be required. The Board, the letter adds, do not wish to offer any objection to the procedure by the Bill, should the Council decide to follow that course.

EXCAVATIONS AT OLD SARUM.

The systematic excavation of the site of Old Sarum, which has been undertaken by the Society of Antiquaries, with the co-operation of the Wiltshire Archæological Society, is to be commenced at once, and will probably be carried on until the end of September of this year. If a sufficient research fund is forthcoming, the excavations will be continued for several years. The direction of the work is to be in the hands of Colonel Hawley, F.S.A., Mr. W. H. St. John Hope, M.A., and Mr. Mill Stephenson, F.S.A., the three delegates appointed by the Society of Antiquaries, one of whom will always be present to superintend the actual excavation. It is proposed that the whole site—the Norman castle, cathedral, and city, as well as the earlier earthworks, and whatever remains may exist on the hill of the Saxon, Roman, and pre-historic periods—shall be scientifically and exhaustively examined.

ROMAN REMAINS ON HUMBERSIDE.

A short time ago the waters of the Humber estuary changed their course, and at one point on the North Lincolnshire shore this caused the washing away of an accumulation of silt which had not previously been disturbed for a quarter of a century. At low-water mark, and resting upon the old bank, a working-man antiquary recently found a well-made vase of typical Roman grey-ware. It was unusually globular in shape, and amongst the mud inside were six silver coins and a silver ring. The coins are remarkable for their excellent state of preservation, five of them being in mint condition. All except one (Valens), which is an inch in diameter, are of the usual size of Roman silver coins, viz., about as large as a sixpenny piece. These have been examined by Mr. C. W. Fennell, and are referable to Valens (A.D. 328-378), Valentianus (A.D. 321-375), Julianus II. (331-363), Constantius II. (317-361), and Gratianus (359-383). The ring is also as good as new, and is of solid silver. It has a solid square bezel, upon which is inscribed a crude representation of the dove and olive branch, indicating Christian influence. The specimens are now in the Hull Museum.

Capital and Labour.

STATE OF EMPLOYMENT IN THE BUILDING TRADES.

Employment in July remained slack generally except with painters, who continued fairly well employed. It showed little general change compared with a month ago and a year ago. The percentage of trade union carpenters and joiners unemployed at the end of June was 10·0 as compared with 10·4 a month ago and 11·1 a year ago; and for plumbers, at the same dates, the percentages were 14·6, 14·1, and 11·9 respectively. These percentages were usually exceeded in London, the northern counties, Scotland, and Ireland. Returns received from bricklayers, masons, and labourers' unions show a decline compared with a month ago. For London the trade union returns show that 11·8 per cent. of carpenters and joiners were unemployed at the end of July, as compared with 13·5 a month ago and 15·6 a year ago; the corresponding percentages for plumbers were 20·0, 17·5, and 13·4. Returns received from 664 firms employing 39,355 workpeople at the end of July show that there was an increase of 4·0 per cent. in the total number employed by them as compared with a month ago, and a decrease of 8·7 per cent. as compared with a year ago. The increase compared with a month ago was chiefly in the London district, while the decrease compared with a year ago was most marked in the Lancashire and Cheshire district.—*Board of Trade Labour Gazette.*

Patents.

APPLICATIONS PUBLISHED.*

15,628 of 1908.—The Coslett Anti-Rust Syndicate, Ltd., and Thomas Watts Coslett: Treatment of iron or steel for preventing oxidation or rusting.

16,853 of 1908.—Crow, Harvey, & Co., Ltd., and Alfred Paton Costigane: Machines for straightening bars and tubes.

16,865 of 1908.—Henry Adolphus Tristram: Stair treads and like surfaces of wood.

17,242 of 1908.—David Armstrong: Adjustable fire-blower or screen for increasing the air draught in chimneys of dwelling-houses, and to prevent smoky chimneys.

18,412 of 1908.—Robert Johnson, John William Johnson, and George Johnson: Method of shaft sinking and lining by ferro-concrete tubing.

24,576 of 1908.—John Marson Lamb: Bricks or blocks for building purposes.

27,902 of 1908.—Sigmund von Medvecsky: Process of producing a fireproof concrete compound.

889 of 1909.—Hugo Sack: Rolling of bars or girders of I-section, and apparatus therefor.

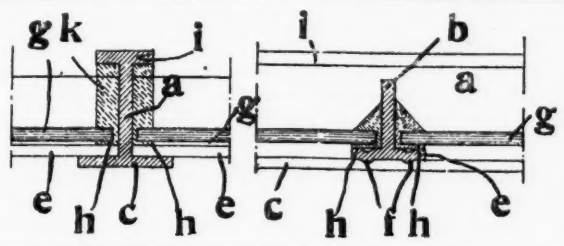
3,858 of 1909.—William Calway: Building of concrete, cement, and like walls

5,585 of 1909.—Hugo Schulte-Steinberg: Process of moulding bricks.

* All these applications are in the stage in which opposition to the grant of patents upon them can be made.

5,826 of 1909.—Frederick Rings (communicated by Emil Preiss): Walls.

6,005 of 1909.—Alfred Emanuel Lindau: Bar for reinforcing concrete.

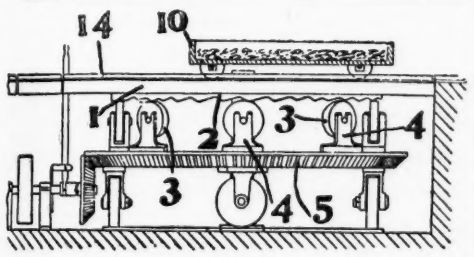


10,824 of 1909.—William Henry Baxter: Screens employed for screening or grading crushed or broken stone or ore, or like material.

12,328 of 1909.—William Thomas Edward Barker and Joseph Blanchet Rowell: Chimney and ventilating shaft tops.

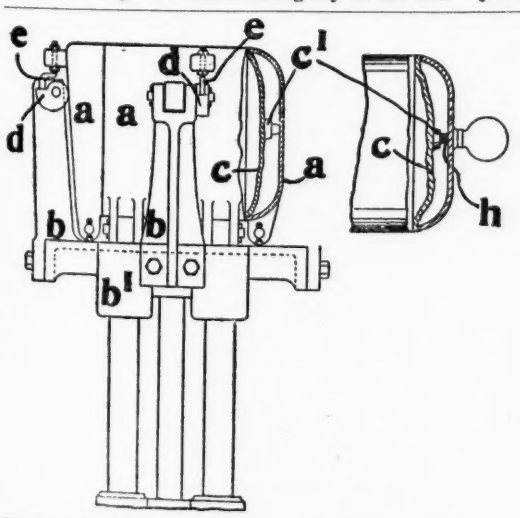
SELECTED PATENTS.

7,153 of 1908.—William Brebner: Manufacture of concrete blocks or slabs. This relates to a mould-shaking apparatus for artificial stone blocks, wherein the shaking table 1 is vibrated vertically by means of wheels 3 mounted in bearings 4 on a rotating wheel 5, coacting with a serrated circular track 2 fixed to the underside of the table. The track 2 and



wheel 3 may alternatively be mounted on the wheel 5 and table 1 respectively. Two such tables are employed side by side, and the moulds 10 are moved across both tables on rails 14. The serrations of the track 2 may be of different contours to produce different effects, and the track may be composed of sections, the contours of the serration of the sections being, if desired, periodically varied.

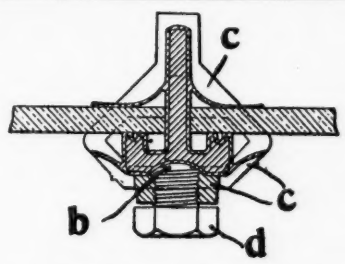
7,463 of 1908.—Francis Dring: Machinery or apparatus for the manufacture of artificial stone, concrete, or other building blocks. This relates to moulds having hinged sides *a*, which are closed by the action of a vertically moving frame b^1 carrying extensions *b* engaging ribs on the mould sides, and consists in providing detachable face-plates *c* with bosses c^1, so that they may be secured to the mould sides, without being in full surface contact therewith, by means of screwed pins *h*. The mould sides are forced together and held rigidly at the end



of the vertical movement of the frame b^1 by the engagement of eccentric wheels or cams *d* on the extensions *b*, with adjustable projecting pins *e* on the sides.

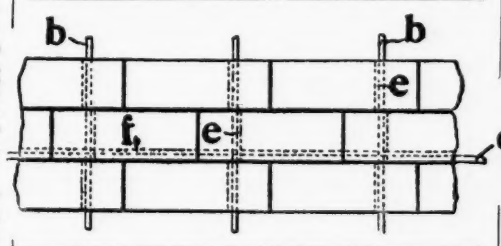
7,521 of 1908.—The Firm of David Hirsch: Iron-frame windows. This relates to window frames which are constructed of I-section bars *a*, the central webs of which are perforated to receive inverted T-section crossbars *b*, the flanges *e* of which rest upon the flanges *e* of the bars *a*. The flanges *e* are provided with projections *f*, which fit into corresponding depressions in the flanges *c*, to prevent relative movement of the parts. In glazing, the glass *g* is laid on a layer of putty or other cement *h*, another layer of putty *k* being used to fill the space between the glass and the upper flange *i*.

7,522 of 1908.—Henry Hope & Sons, Ltd., and John Arthur Hope: Glazed roofs. This relates to the shoes which secure the lead-covered glazing bars to the purlins. In order to prevent relative movement between the



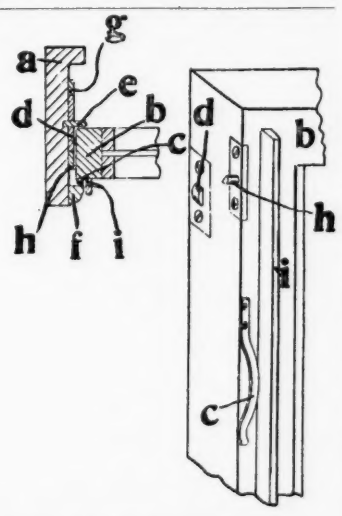
shoe and the glazing bar without inserting screws, etc., through the lead cover the bar is recessed at *b* and the end of a set-screw d, engaging a threaded hole in the shoe, enters the recess.

7,590 of 1908.—Charles Marius Jean Roch and L. G. Mouchel & Partners, Ltd.: Building of walls and other like structures of bricks, tiles, and slabs. This relates to bricks for walls and other constituent parts of buildings, tanks, chimneys, and piers, which are formed with



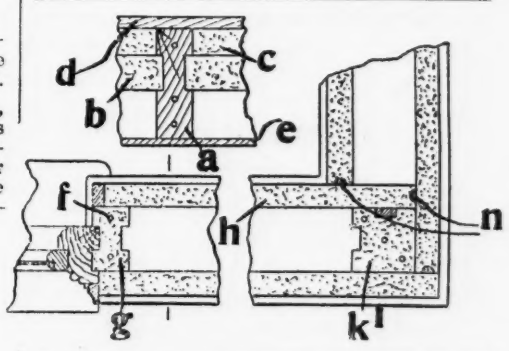
vertical slots *e* in the end faces to enable the wall or the like to be reinforced with vertical bars *b*, and yet be built with the usual bonding. The undersides may also be grooved at *f* to accommodate horizontal reinforcements *c*.

7,765 of 1908.—Harold Moore: Sash windows. This relates to sash windows, and consists in providing pins *h* secured to the sash stile *b*,



which pins are pressed into engagement with racks *j* on the frame *a* adjacent to the parting-bead *e* by band springs *c* attached either to the face of the sash stile or to the stop bead *f*. To raise or lower a sash, it is pulled forward against the action of the springs *c*, so that the pin *h* is clear of the rack teeth, the sash then being free to move vertically. Rollers *d* may be provided on the sashes to reduce friction, and a strip *i* may be secured to the face of the sash tile to reduce draught.

8,245 of 1908.—George Edward Clare: Reinforcing concrete walls, floors, fencing, and the like. This relates to concrete structures of the slab and grooved-post type. Concrete walls are formed of grooved posts or studs k^1, and cement slabs *h*, which may be slid down in the grooves *g* for single walls or nailed to the faces of the posts for double walls. The posts are reinforced by twisted, square, flat, or round rods *f*, or by two rods twisted together, and the slabs by wire netting; the slabs are tongued and grooved on the top and bottom edges and have grooves *n* on the vertical edges to receive cement grouting. Window and door



frames may be fitted into the grooves *g*. In constructing floors the slabs *b*, supported by wooden or concrete joists *a*, carry a cement filling *c*; the lower face is covered by slabs *e*, and the upper face by boards *d*.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

August 7.—By SALTER, SIMPSON, & SONS (at Norwich).

Little Frensham, Norfolk.—Old Hall Farm, 294 a. 2 r. 39 p., f.	£7,100
The Lower Farm, 210 a. 3 r. 19 p., f. and c.	3,700
Cottage and arable land, 21 a. 1 r. 29 p., f.	530
The Post Office and 2 r. 38 p., f.	150
Four cottages and enclosures, 2 a. 3 r. 31 p., f.	530
The Crown Inn and 3 a. 3 r. 12 p., f.	525

August 10.—By COOKE BROS. & ROBERTS (at Newtown).

Newtown, Montgomery.—Woodside, f.	650

August 12.—By R. W. DENYER & CO. (at Maidstone).

Goudhurst, Kent.—Hop, fruit, and pasture land, 22 a. 3 r. 15 p., f.	300
Two cottages and pasture land, 12 a. 1 r. 0 p., f.	340
Cranbrook, Kent.—Two cottages and 1 a. 0 r. 16 p., f.	135
Maidstone, Kent.—8 to 16 (even), Allen-st., f., w.r. 80*l.* 12s.	845
East Peckham, Kent.—Yew Tree-cottages, f., y. and w.r. 23*l.*	205
The Forge and house adjoining, f., q.r. 16*l.*	210
Rose Villa, f., q.r. 15*l.*	350
Walnut Cottage, f., q.r. 5*l.*	200
Burnt House, f., q.r. 12*l.*	185
Nettlestead, Kent.—Nightingale-cottages, f., w.r. 13*l.*	200
Lenham, Kent.—West-st., two cottages, f., w.r. 16*l.* 18s.	200

WITTON & LAING (at Chudleigh).

Chudleigh, Devon.—Culver House and Culver Cottage, 8 a. 0 r. 16 p., f.	2,000
Herridge Orchard, 3 a. 0 r. 27 p., f.	470
New Exeter-st., five cottages, f.	565
Burgages Farm, 8 a. 2 r. 11 p., f.	995
Pasture and arable land, 8 a. 0 r. 30 p., f.	860

By DICKINSON, RIGGALL, & DAVY (at Brigg).

Goxhill, Lincs.—Two farms, 86 a. 0 r. 17 p., f.	2,640
Bottesford, Lincs.—Freehold farm, 28 a. 0 r. 15 p.	1,010

August 16.—By OFFIN & RUMSEY.

Rayleigh, Essex.—Enclosure of pasture land, 18 a. 1 r. 8 p., f.	1,325
Canewdon, Essex.—Norpitts Farm, 370 a. 2 r. 17 p., f.	2,500
Great Burstead, Essex.—New Lodge and 42 a. 3 r. 14 p., f.	1,985
Three enclosures of pasture land, 6 a. 0 r. 27 p., f.	440
Six cottages and two enclosures of land, f.	825

August 18.—By BALLS & BALLS (at Braintree).

Finchingfield, Essex.—Sculpins Farm, 186 a. 3 r. 17 p., f.	1,900

By GEORGE S. ANDREWS (at Wells-next-Sea).

Wells-next-Sea, Norfolk.—The Buttlands, four houses, f.	750
Freeman-st., seven cottages and shop, f.	430
Staithe-st., residence and shop, f.	950

August 19.—By NEWBON, SHEPHARD, & EDWARDS.

Holloway.—13 and 15, Archibald-rd., u.t. 58 yrs., g.r. 15*l.*, y. and e.r. 84*l.*	630
63, Hilldrop-cres., u.t. 44 yrs., g.r. 9*l.*, e.r. 55*l.*	255
Barnsbury.—2, Matilda-st., u.t. 31½ yrs., g.r. 1*l.* 3s., y.r. 34*l.*	200

***Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. beerhouse; p.h. for public-house; o. for offices; s. for shops; ct. for court.**

List of Competitions, Contracts, etc.

For some Contracts still open, but not included in this List, see previous issues. Those with an asterisk (*) are advertised in this Number: Competitions, iv.; Contracts, iv. vi. viii. x.; Public Appointments. xvi.; Auction Sales, xxiv.

Certain conditions, beyond those given in the following information, are imposed in some cases, such as: the advertisers do not bind themselves to accept the lowest or any tender; that a fair wages clause shall be observed; that no allowance will be made for tenders; and that deposits are returned on receipt of a bonâ-fide tender unless stated to the contrary.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

***** It must be understood that the following paragraphs are printed as news, and not as advertisements; and that while every endeavour is made to ensure accuracy, we cannot be responsible for errors that *may* occur.**

Competitions.

SEPTEMBER 1.—**New Cross, S.E.**—The Council of the Metropolitan Borough of Deptford invite designs for a Branch Library at New Cross. Premiums of 50, 25, and 10 guineas. Limited to architects practising in the City or County of London. Conditions from Mr. Vivian Orchard, Town Clerk, Town Hall, New Cross-road, S.E. For further particulars see advertisement in our issue of June 12.

SEPTEMBER 28.—**Lyminge.**—SEWAGE DISPOSAL.—The Elham R.D.C. invite schemes and estimates for the disposal of the sewage of Lyminge Parish. Mr. R. Lonergan, Clerk, 11, Cheriton-place, Folkestone.

OCTOBER 1.—**Aberdare.**—HOSPITAL.—The U.D.C. of Aberdare invite competitive designs for a fever hospital for fifty-two patients, including administrative block, outbuildings, etc. Premiums of 100*l*., 50*l*., and 25*l*. are offered for the designs placed first, second, and third respectively. An architectural assessor will be appointed on the nomination of the President of the Royal Institute of British Architects, also a medical assessor to act jointly. Particulars, etc., of the competition, together with a plan of the site, may be obtained from Mr. Thomas Phillips, Clerk, Town Hall, Aberdare, on payment of a sum of 3*l*. 3s.

OCTOBER 11.—**Hull.**—TRAINING COLLEGE.—The Hull Education Committee offer premiums of 150*l*., 100*l*., and 50*l*. for drawings submitted in competition for a new college. For further particulars see advertisement in our issue of July 24.

* NO DATE.—**Cardiff.**—NATIONAL MUSEUM.—Competitive designs are invited for the erection of a new National Museum at Cardiff. Three premiums are offered. See advertisement in this issue for further particulars.

NOVEMBER 1.—**Kendal.**—TECHNICAL SCHOOL.—The Corporation of the Borough of Kendal invite architects residing and practising in Westmorland to submit a competitive design, together with a written description and estimate for the erection of a technical school in the said Borough. A premium of 15*l*. is offered for the design considered by the Corporation first in order of merit, and further premiums of 10*l*. and 5*l*. respectively for those which are, in their opinion, second and third in order of merit; such designs, on payment of the promised premiums, shall become the absolute property of the Corporation. Particulars, etc., together with the plan of site, showing levels, etc., may be obtained free, on application to the Borough Surveyor. (Mr. J. E. Bolton, Town Clerk.)

* NOVEMBER 30.—**Herne Bay.**—PAVILION ON PIER.—The Herne Bay U.D.C. invite designs for pavilion on pier. Two premiums are offered. See advertisement in this issue for further particulars.

NO DATE.—**Eltham, Kent.**—PARISH HALL.—The Committee invite designs for a Parish Hall. Particulars may be obtained from Mr. G. Nelson Prior, Hon. Secretary, Watcombe, Lassa-road, Eltham. For particulars see advertisement in our issue of August 21.

Contracts.

BUILDING.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

AUGUST 30. — **Widnes.** — SCHOOL WORKS.—The Widnes Education Committee invite tenders for:—(*a*) The removal of the gallery in the boys' department of the St. Bede's R.C. School, Widnes; (*b*) the alterations to the windows of the West Bank Council School, Widnes. Plans, etc., may be seen at the Education Office, Town Hall, Widnes.

AUGUST 31.—**Barton-upon-Humber.**—WALL, ETC.—The Barton-upon-Humber U.D.C. invite tenders for the construction of a retaining wall and clough door in the butts drain, where it joins the Barton Haven, for the purpose of a sluice. Plans, etc., are deposited at the office of Mr. D. Houghton, the Surveyor to the Council.

AUGUST 31.—**Coity.**—WALL.—For erection of a boundary wall, 400 yds. in length, or thereabouts, at Spencer-road, Coity, near Bridgend. For particulars apply to Mr. S. David, Bryn Garw, Coity, near Bridgend.

AUGUST 31. — **Plymouth.** — ALTERATIONS AND REPAIRS.—The Guardians of the Poor of the Town of Plymouth invite tenders for certain alterations and repairs required at 36, Looe-street. Drawings, etc., may be seen at the offices of the architect, Mr. F. A. Wiblin, 92, Old Town-street, Plymouth.

AUGUST 31.—**Sandbach-Heath.**—SCHOOL WORKS.—Alterations to Sandbach-Heath Church of England Schools. Plans can be seen, and bill of quantities obtained, on application to Messrs. Alfred Price & Son, architects and surveyors, Sandbach, on payment of 10s. 6d.

AUGUST 31.—**Tavistock.**—HOUSE.—Erection and completion of a small detached house at Marytavy, Tavistock, for Mr. J. Collins. Plans, etc., may be seen by appointment at Palmer House, Marytavy, or the offices of Mr. Morley B. Collins, architect, Clinton-road, Redruth.

SEPTEMBER 1.—**Llwynypia.**—PREMISES.—Erection and completion of business premises at Llwynypia for Mr. E. J. Stockwell, butcher, Tonypandy. Mr. R. S. Griffiths, M.S.A., architect and surveyor, Tonypandy.

SEPTEMBER 1.—**London.**—SKITTLE ALLEY, ETC.—The Metropolitan Asylums Board invite tenders for constructing a new skittle alley and iron shelter at the Northern Convalescent Fever Hospital, Winchmorehill, N., in accordance with drawing, etc., prepared by Mr W. T. Hatch, M.Inst.C.E., M.Inst.M.E., Engineer-in-Chief. The drawing, etc., may be inspected at the office of the Board, Embankment, E.C., and can then be obtained upon payment of a deposit of 1*l*.

SEPTEMBER 1. — **Londonderry.** — HALL. — For a pavilion music-hall at Strand-road for Mr. John Mulholland. Plans, etc., to be seen at the offices of Mr. J. P. M'Grath, C.E., architect, 6, Castle-street, Londonderry.

SEPTEMBER 1. — **Londonderry.** — REBUILDING.—For rebuilding stores at Chamberlain-street, Londonderry, for Mr. John M'Geady. Plans, etc., to be seen at the offices of Mr. J. P. M'Grath, architect, 6, Castle-street, Londonderry.

SEPTEMBER 2. — **Golcar.**—HOUSES.—Works, except masons', required in the erection of four dwelling-houses in Longcroft-road, Golcar. Plans may be seen, and quantities obtained, at office of Mr. Arthur Shaw, architect, Golcar.

SEPTEMBER 2.—**Wincanton.**—HOSPITAL BUILDINGS.—Wincanton District Isolation Hospital Committee invite tenders for new hospital buildings, to be erected on a site at Wincanton, together with roads, drains, fences, etc. Plans, etc., may be seen at office of Mr. Arthur J. Pictor, A.R.I.B.A., Bruton, Somerset, when bills of quantities may also be obtained by payment of a deposit of 1*l*. 1s.

SEPTEMBER 3.—**Crooksling, Brittas.**—SANATORIUM.—The Dublin Joint Hospital Board invite tenders for the erection of sanatorium buildings of wood and iron at Crooksling, Brittas. Plans, etc., may be examined, and full particulars may be obtained, on application to the offices of the Board, Municipal Buildings, Cork Hill, Dublin.

SEPTEMBER 3. — **Gelli.** — TEMPORARY IRON SCHOOL BUILDING.—Rhondda U.D.C. invite tenders for the provision and erection of a temporary iron school building in the playground of the Gelli Boys' School. Full particulars, etc., may be obtained upon application to Mr. Jacob Rees, architect, Hillside Cottage, Pentre, Rhondda, at which address the design may also be seen.

SEPTEMBER 4.—**Cwmbach.**—ALTERING, ETC., CHAPEL.—Altering and renovating "Bryn Sion" Chapel, Cwmbach, near Aberdare. Plans, etc., may be seen either at office of Mr. T. Roderick, architect, Clifton-street, Aberdare, or with Mr. W. James, 5, Rose-row, Cwmbach.

SEPTEMBER 4.—**Ely, Cardiff.**—ADDITIONS, ETC., TO WORKHOUSE.—The Guardians of Cardiff Union invite tenders for making additions and alterations at Ely Workhouse, according to plans, etc., prepared by their Architect, Mr. Edwin Seward, F.R.I.B.A., Queen's-chambers, Cardiff, from whom bills of quantities, etc., may be obtained on payment of 1*l*. 1s.

SEPTEMBER 4. — **Llwynypia.** — ALTERATIONS, ETC. — Tenders are invited for alterations and additions to No. 13, Llwynypia-road, Llwynypia, for Mr. J. J. Reinecke. Plans, etc., to be seen at office of Mr. R. S. Griffiths, M.S.A., architect and surveyor, Tonypandy.

SEPTEMBER 6.—**Derby.**—ALTERATIONS AT WORKHOUSE.—The Board of Guardians invite tenders from Derby builders for making certain alterations at the Union Workhouse and for the erection of a small ward thereat. Plans may be seen, and specification, etc., obtained, from Mr. F. C. Coulthurst, architect, 4 Albert-street, Derby, on payment of a deposit of 1*l*. 1s.

SEPTEMBER 6. — **Pontlottyn.** — ALTERATIONS, ETC.—Alterations and extensions, including the building of a new schoolroom and classroom, to the Primitive Methodist Chapel, Pontlottyn. Plans, etc., may be seen with Mr. Tippett, Trevor Villa, Pontlottyn, or at office of Mr. W. Beddoe Rees, architect, 3, Dumfries-place, Cardiff.

SEPTEMBER 6. — **Pontypool.** — ALTERATIONS, ETC. — Alterations and additions to the Monmouthshire Reformatory, Little Mill, Pontypool. The plans, etc., can be inspected at the Reformatory, and at the office of the architect, Mr. W. H. D. Caple, F.R.I.B.A., of 2, Church-street, Cardiff.

* SEPTEMBER 6.—**Royston.**—SCHOOL.—The Hertfordshire Education Committee invite tenders for erection of a school at Royston. See advertisement in this issue for further particulars.

SEPTEMBER 7. — **Colbren.** — CHAPEL.—Erection and completion of a new Welsh Baptist Chapel at Colbren, near Seven Sisters, *vid* Neath. Plans, etc., may be seen with Mr. R. Jeffreys, Penygraig Farm Colbren, or at office of Mr. W. Beddoe Rees, architect, 3, Dumfries-place, Cardiff.

SEPTEMBER 8. — **Brechin.**—POST-OFFICE.—The Commissioners of H.M. Works and Public Buildings invite tenders for the erection of a new Post-office, Brechin. Drawings, etc., may be seen on application to the Postmaster, Brechin. Bills of quantities and forms of tender may be obtained at H.M. Office of Works, Parliament-square, Edinburgh, on payment of 1*l*. 1s.

* SEPTEMBER 8. — **Brentwood.** — COOKERY, ETC., CENTRE.—The Essex Education Committee (Billericay District Advisory Sub-Committee) invite tenders for a cookery and wookwork centre at Brentwood. See advertisement in this issue for further particulars.

SEPTEMBER 9. — **Hartlepool.**—ALTERATIONS TO PUMP WELL.—The Guardians invite tenders for alterations to pump well at the Workhouse, and from engineers for fitting up two pumps and supply necessary fittings. Plan, etc., may be seen at the office of the Architect to the Board, 8, Fountain-terrace, West Hartlepool.

SEPTEMBER 10. — **Stanley, etc.** — SCHOOL WORKS.—The West Riding Education Committee invite whole or separate tenders for the following works:—Stanley, Outwood Provided School, alterations and asphalting (joiner and asphalter); Bolton-on-Dearne, Goldthorpe Provided School, new heating apparatus and heating chamber (builder and heating engineer). Plans may be seen, and specifications with quantities obtained, on application to the West Riding Architect, County Hall, Wakefield. A deposit of 1*l*. in each case must be sent by separate letter to the West Riding Treasurer, County Hall, Wakefield.

SEPTEMBER 11. — **Coleraine.** — ORANGE HALL.—Erection of a new orange hall at Coleraine for the Building Committee. Plans, etc., can be seen at the office of Mr. S. J. M'Fadden, C.E., architect, Queen-street, Coleraine.

SEPTEMBER 13.—**Birmingham.**—MATRON'S HOUSE.—The Guardians invite tenders for the erection of a matron's house at their Infirmary, Dudley-road. Plans can be seen, and particulars obtained from the architect's, Mr. W. H. Ward, Paradise-street, Birmingham.

SEPTEMBER 14. — **Hartlepool.** — SCHOOL WORKS.—The C.C. of Durham invite tenders for extensions to the Hartlepool Henry Smith School in accordance with plans prepared by Mr. James Garry, architect, West Hartlepool, at whose offices the plans and specification may be seen. Bills of quantities may be obtained from Mr J. A. L. Robson, Secretary for Higher Education, Shire Hall, Durham.

SEPTEMBER 20.—**Cambridge.**—ADDITIONS TO PUMPING STATION.—Erection of additions to the Sewage Pumping Station, Riverside, Cambridge, according to plans, etc., prepared by the Borough Surveyor. A copy of the plans, etc., may be seen at the office of the Borough Surveyor, Guildhall.

* SEPTEMBER 22. — **Blackpool.** — LIBRARY, ETC.—The Blackpool B.C. invite tenders for new Central Library and new Art Gallery, Blackpool. See advertisement in this issue for further particulars.

NO DATE. — **Aberfan.**—COTTAGES.—Tenders wanted for two small cottages. Apply Mr. Collis, Belle Vue Cottage, Aberfan.

NO DATE.—**Chesterfield.**—BUILDINGS.—New buildings at Chesterfield for the Territorial Force Association. Name and address to Mr. W. H. Wagstaff, A.M.Inst.C.E., architect and surveyor, Chesterfield.

NO DATE.—**Ilkley.**—COTTAGE.—Erection and completion of cottage, King's-road, Ilkley. Quantities and all particulars may be obtained from the architects, Messrs. Garside & Pennington, Pontefract and Castleford.

NO DATE.—**Leeds.**—ASSEMBLY HALL, ETC.—Assembly hall and club premises in Cross Stamford-street, Leeds, for the Amalgamated Jewish Tailors' and Pressers' Trade Union. Names to Mr. Joseph J. Wood, A.R.I.B.A., 10, Park-row, Leeds.

NO DATE. — **Llwynypia.** — ALTERATIONS.—Alterations, etc., to general offices at Llwynypia, Glam., for Messrs. the Glamorgan Coal Company, Ltd. Plans may be seen, and bills of quantities obtained, at the offices of Mr. Edgar G. C. Down, A.R.I.B.A., architect and surveyor, 31, High-street, Cardiff, on deposit of 2*l*. 2s.

ENGINEERING, IRON, AND STEEL.

SEPTEMBER 7.—**Haine.** — DEEPENING WELL. — For deepening the well at the Isolation Hospital at Haine, near Ramsgate, the driving of additional adits, and the lowering of the pumping plant, for the Joint Hospital Board. Form of tender, etc., can be obtained at the office of Mr. H. Bertram Langham, Architect, Bank-chambers, High-street, Broadstairs.

SEPTEMBER 10.—**Felixstowe and Walton.**—ELECTRICITY METERS.—The U.D.C. of Felixstowe and Walton invite tenders for electricity meters. Specifications, etc., may be obtained at the offices of the Consulting Engineer, Mr. Reginald P. Wilson, 66, Victoria-street, Westminster, S.W., on payment of a sum of 1*l*. 1s.

ENGINEERING—*continued.*

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

SEPTEMBER 15.—**Newcastle-upon-Tyne.**—CLINKER GRINDING PLANT IN CONNEXION WITH WALKER REFUSE DESTRUCTOR.—Tenders are invited for the supply and erection of a small steel frame structure, together with plant. Copy of the general conditions, specification, etc., may be obtained, and the drawings inspected, at the City Engineer's office, Town Hall, Newcastle-upon-Tyne, on payment of the sum of 2*l.* 2*s.* to the City Treasurer, Town Hall, Newcastle-upon-Tyne. Prints of any of the three plans may be obtained on payment of 2*s.* 6*d.* each to the City Treasurer, which sum will not be returned.

SEPTEMBER 20.—**Lincoln Waterworks.**—BRIDGES.—The Lincoln Corporation invite tenders for the construction of a steel bridge, consisting of a river span of 262 ft. and five spans of 66 ft., with all necessary foundations and piers for supporting same, and a line of 21-in. welded steel pipes carried across bridge. Specification, etc., may be obtained at the office of the Engineer, Mr. Neil McK. Barron, Waterworks Engineer, Lincoln, upon production of a receipt from the City Accountant for 5*l.* 5*s.*

SEPTEMBER 20.—**Pontllanfraith.**—BRIDGE WORKS.—Monmouth Main Roads and Bridges Committee invite tenders for the pulling down of the existing bridge at Pontllanfraith and the erection of a steel structure. Plans, etc., may be seen at the office of Mr. William Tanner, F.S.I., County Surveyor, and a copy of the quantities obtained on payment of 1*l.* 1*s.*

SEPTEMBER 22.—**Leith Harbour and Docks.**—CONSTRUCTION OF GRAVING DOCK.—The Commissioners for the Harbour and Docks of Leith invite tenders for the construction of a graving dock and relative works at the north-west corner of the Imperial Dock, in conformity with drawings, etc., which may be seen at the office of the Engineer, Mr. Peter Whyte, M.Inst.C.E., Superintendent of the Harbour and Docks, Tower-place, Leith. Forms of tender, etc., may be obtained from the Engineer on payment of 3*l.* 3*s.*

MISCELLANEOUS.

AUGUST 31.—**Margate.**—TURF.—Tenders are invited for the supply and delivery of 8,000 sq. yds. of good turf for the park and greens in the Borough, and of an additional 2,000 yds. at the option of the Council. Samples of turf must be sent to the Head Gardener, Dane Park, Margate. Mr. Edward Brooke, Town Clerk, Town Clerk's Office, 13, Grosvenor-place, Margate.

AUGUST 31. — **Portsmouth.**—FURNITURE.—Tenders are invited for the supply of artices of furniture for the police offices in the Town Hall and the Fratton-road Police-station. Full particulars can be obtained at the Chief Constable's office at the Town Hall.

SEPTEMBER 3. — **Broadwoodwidger.** — STEAM ROLLING.—The R.D.C. of Broadwoodwidger, Devon, invite tenders for steam rolling the main and district roads. For further particulars apply to Mr. S. Werren, surveyor, Kennacott, Yeolmbridge, near Launceston.

SEPTEMBER 4. — **Gellygaer.** — STREET LANTERNS. — Gellygaer U.D.C. invite tenders for the supply of 150 or more street lanterns for their district. Particulars, etc., obtained upon application to the Council's Surveyor, Mr. Jas. P. Jones, F.I.S.E., Council Offices, Hengoed, *vid* Cardiff.

SEPTEMBER 7. — **Carnarvon.** — FIRE ESCAPES.—Tenders are invited for supplying alternative fire exits in connexion with certain wards at the Workhouse, in accordance with plans, etc., drawn out by Mr. Rowland Lloyd Jones, M.S.A., Carnarvon, copy of which may be had on application.

SEPTEMBER 9. — **Edinburgh.** — FIRE ESCAPE.—The Corporation of Edinburgh invite tenders for the supply of a horse-drawn gas-power extended turn table fire escape and water tower. Further particulars may be obtained from the Firemaster, Fire Brigade Headquarters, Edinburgh.

SEPTEMBER 9. — **Salford.** — MOTOR FIRE ENGINES.—Tenders are invited for the supply of one or two petrol motor fire engines and hose tenders combined; and also tenders for the supply of a petrol motor ambulance van, complete. Full particulars may be obtained on application to the Chief Officer, Central Fire Station, The Crescent, Salford.

SEPTEMBER 13. — **Stansted.** — SCAVENGING.—The Stansted P.C. invite tenders for scavenging a portion of the Parish. For further particulars apply to Mr. E. T. Watts, Surveyor, Thorley, Bishop's Stortford.

SEPTEMBER 16.—**Newbury.**—FENCING.—Tenders are invited from local builders and ironmongers for the provision and fixing of about 700 yds. of fencing and entrance gates for the new cemetery. Specifications, etc., may be seen at office of Mr. S. J. L. Vincent, A.M.Inst.C.E., Borough Surveyor, Mansion House-street.

NO DATE.—**Newbury.**—GAS FITTINGS.—Tenders are invited from local gasfitters for keeping in order the gas fittings in Corn Exchange, Municipal Buildings, etc. Specifications may be seen at office of Mr. S. J. L. Vincent, A.M.Inst.C.E., Borough Surveyor, Mansion House-street.

PAINTING, etc.

AUGUST 30.—**Blackrock.**—PAINTING.—The U.D.C. of Blackrock invite tenders for the following work:—(1) Painting the railings in front of Town Hall, the windows and doors of Town Hall, Technical School, and Library; (2) painting inside woodwork of motor house; (3) painting No. 2 fire escape. Specifications can be seen at office of Mr. R. Finlay Heron, Town Clerk, Town Hall, Blackrock, Co. Dublin.

AUGUST 30.—**Weymouth, etc.**—CLEANING AND REPAINTING.—Great Western Railway Directors invite tenders for cleaning and repainting stations, etc., at the following places:—Contract No. 34, stations at Weymouth, Portland, and Easton; contract No. 35, stations at Bridport (West Bay), Grimstone, Dorchester, Broadway, Portesham, and Abbotsbury; contract No. 36, stations at Bampton, Bridgwater, Somerton, and Langport, East; contract No. 37, Locomotive Department buildings at Weymouth and Bridport; contract No. 38, Locomotive Department buildings at Bridgwater, Taunton, and Exeter. Specifications may be seen, and forms of tender, etc., obtained, at the office of the Engineer at Taunton between the hours of 10 a.m. and 4 p.m.

SEPTEMBER 1.—**Dartford.**—CLEANING AND PAINTING.—The Metropolitan Asylums Board invite tenders for cleaning and painting works and repairs at Gore Farm Convalescent Fever Hospital, near Dartford, Kent, in accordance with drawings, etc., prepared by Mr. W. T. Hatch, M.Inst.C.E., M.Inst.M.E., Engineer-in-Chief. The drawings, etc., may be inspected at the office of the Board, Embankment, E.C., and can then be obtained upon payment of a deposit of 1*l.*

SEPTEMBER 2.—**Dowlais and Blaina.**—DECORATING, ETC.—Decorating, etc., at the Wimborne Hotel, Dowlais, and the Queen's Hotel, Blaina. Particulars at the office of Mr. C. M. Davies, 112, High-street, Merthyr.

SEPTEMBER 7. — **Haine.** — PAINTING.—For painting the outside of the Isle of Thanet Isolation Hospital at Haine, near Ramsgate, for the Joint Hospital Board. Form of tender, etc., can be obtained at the office of the Board's Architect, Mr. H. Bertram Langham, Bank-chambers, High-street, Broadstairs.

SEPTEMBER 7. — **Lydiard Millicent.** — MORTUARY, ETC.—A mortuary, disinfecting chamber, and laundry at the Isolation Hospital, Stone-lane, Lydiard Millicent, for the Cricklade and Wootton Bassett R.D.C. Plans, etc., may be seen on application at the office of the architect, Mr. R. J. Beswick, 10, Victoria-road, Swindon.

* SEPTEMBER 9.—**Mile End, E.**—PAINTING, ETC.—The Guardians of the Mile End Old Town invite tenders for cleaning, painting, distempering, etc., the wards, corridors, kitchens, and offices of the Infirmary in Bancroft-road. See advertisement in this issue for further particuars.

SEPTEMBER 20. — **Halifax.**—PAINTING.—The Health Committee of the Halifax Corporation invite tenders for the outside painting of three houses, and the inside and outside painting of sheds, stables, and mortuary, situate at the Scavenging Depôt, Lister-lane and Hall-street. Plans, etc., may be seen, and forms of tender obtained, on application to Mr. James Lord, M.Inst.C.E., Borough Engineer, Town Hall, Halifax, upon payment of the sum of 1*l.*

NO DATE. — **Shotton Colliery.** — PAINTING.—Tenders wanted for the repainting and decorating of Shotton Colliery Literary and Social Institute. Specification and particulars on application to Mr. Frederick Wilson, accountant, Shotton, Castle Eden.

ROADS, SANITARY, AND WATER WORKS.

AUGUST 28.—**Adel, Leeds.**—EXTENSION OF LAWNSWOOD CEMETERY.—Names to Mr. W. S. Braithwaite, architect and surveyor, 6, South-parade, Leeds.

AUGUST 30. — **Plymouth.** — MAKING-UP. — For making-up and completing streets and lanes. Plans, etc., may be seen at offices of Mr. James Paton, Borough Engineer, Municipal Offices, Plymouth.

AUGUST 30.—**Ponthir.**—ROAD WIDENING.—Widening, re-forming, and ballasting, etc., of Station-road, Ponthir, near Newport, for the Pontypool R.D.C. Plans, etc., can be seen at the office of the Engineer, Mr. D. J. Lougher, Bank-chambers, Pontypool.

AUGUST 30.—**Stone.**—SEWERS.—Stone R.D.C. invite tenders for about 1,000 yds. of sewers, 9 in. and 6 in. diameter, with lamp-eyes and manholes. Also for the construction of outfall works for same, at Stallington-lane, Blythe Bridge. Drawings, etc., can be seen on application to Mr. J. J. Chapman, Surveyor, Stone.

AUGUST 30. — **Wallsend.** — ASPHALTING. — The Wallsend Corporation invite tenders for asphalting the paths at the Richardson Dees Park, Wallsend. Particulars may be obtained on application to Mr. George Hollings, Borough Surveyor, Town Hall, Wallsend.

AUGUST 31. — **Abertridwr.** — STREET WORKS.—Caerphilly U.D.C. invite tenders for the paving, asphaltic tar paving, gravel footways, kerbing, channelling, sewering, etc., of the following private streets, viz.:—(1) Part Caerphilly-road and part High-street, Abertridwr; (2) Ilan-road, Abertridwr. Plans, etc., may be seen, and form of tender obtained, at the Council Offices, Caerphilly, upon depositing the sum of 1*l.* 1*s.*

AUGUST 31.—**North Ormesby.**—ROAD WORKS.—Ormesby U.D.C. invite tenders for the draining, levelling, paving, and making of back Beaumont-road and back Edward-street, North Ormesby. Plans, etc., can be seen on application to Mr. W. G. Harrison, Surveyor, at the Council Offices, High-street, North Ormesby.

AUGUST 31. — **Yardley.**—SEWERS.—Yardley R.D.C. invite tenders for the provision and construction of certain surface-water sewers, together with the construction of manholes, etc. Plans, etc., may be seen on application to the Engineer and Surveyor, Mr. Arthur W. Smith, at the Council House, Sparkhill, near Birmingham. Specification, bill of quantities, etc., may be obtained on payment of 3*l.* 3*s.* to Mr. Francis Ladbury Thompson, Clerk of the Council, Council House, Sparkhill, near Birmingham.

SEPTEMBER 3. — **Llanarmon.** — CULVERT. — The Llansilin R.D.C. invite tenders for the construction of a brick arched culvert (115 ft. in length) over the stream running through the village of Llanarmon D.C. Plans, etc., may be seen, by appointment, at office of Mr. E. Vaughan-Edmunds, M.I.Mun.E., Surveyor, Llanrhaiadr.

SEPTEMBER 4. — **Gellygaer.** — CULVERTING, ETC. — Gellygaer U.D.C. invite tenders for (1) the construction of about 130 yds. of culverting at Cwmfelin, Bedlinog; (2) the erection of a retaining and fence wall for road-widening purposes at Oakland-street, Bedlinog. Plans, etc., can be seen, and bills of quantities obtained, upon application being made to the Council's Surveyor, Mr. Jas. J. Jones, Council Offices, Hengoed, *vid* Cardiff.

SEPTEMBER 4.—**Glasgow.**—PAVING.—The Corporation invite offers for the paving of Roslea-drive, from Meadowpark-street to Cumbernauld-road, with tar macadam. Specifications, etc., may be had on application at the Office of Public Works, City Chambers, 64, Cochrane-street.

SEPTEMBER 6. — **Cheadle.** — STREET WORKS.—The U.D.C. of Cheadle and Gatley invite tenders for the sewering, levelling, metalling, flagging, channelling, and making good Hill Top-avenue, Mellor-street, and Woodfield-road, Cheadle Hulme, in accordance with the plans, etc., to be obtained on application to Mr. E. Sykes, A.M.Inst.C.E., at the Council Offices, Cheadle, near Manchester, on the deposit of 1*l.* 1*s.*

SEPTEMBER 8. — **Belvedere.** — STREET WORKS. — The U.D.C. of Erith invite tenders for making-up Lessness Park-road, Belvedere. Plans may be seen, and specification, etc., obtained, at the Surveyor's office, Bexley-road, Erith, upon payment of 1*l.*

SEPTEMBER 8. — **Holmfirth.** — SEWERS.—Holmfirth U.D.C. invite tenders for the construction of sewers, with all the necessary manholes, etc. Plans, etc., may be seen at the Council's Offices, 49, Huddersfield-road, Holmfirth. Bills of quantities, etc., may be had on application to the engineers, Messrs. Joshua Barrowclough & Son, Holmfirth, on payment of 1*l.* 1*s.* for each of the two contracts.

* SEPTEMBER 8. — **London.** — URINALS. — The Commissioners of H.M. Works, etc., invite tenders for supply of urinals for a period of three years. See advertisement in this issue for further particulars.

SEPTEMBER 10.—**Chart Sutton.**—SANITARY WORK.—The Managers of Chart Sutton Schools invite tenders for sanitary work to be done. Plans, etc., can be seen by applying at the Vicarage.

SEPTEMBER 10. — **Gravesend.** — MAKING-UP, ETC.—Making-up, paving, and channelling Denton-street, situate partly within the Borough of Gravesend and partly within the Rural District of Strood. Plans, etc., can be seen, and forms of tender obtained, at the office of the Borough Surveyor, Mr. F. T. Grant, Town Hall, Gravesend, or at the office of the District Surveyor, Mr. L. Randerson, Blendon Villa, Meopham, from whom forms of tender may also be had.

SEPTEMBER 11. — **Lanark.** — WATER WORKS: LOCHLYOCK EXTENSION.—Contract No. 2:—Pipelaying.—The T.C. of Lanark invite tenders for cutting trenches for and laying and jointing about seven miles of 9-in. cast-iron pipes and other work connected therewith. Plans may be seen, and copies of the specification, etc., may be obtained, at the office of the Engineer, Mr. M. Ratcliffe Barnett, M.Inst.C.E., 124, St. Vincent-street, Glasgow, on payment of 1*l.* 1*s.*

* SEPTEMBER 13. — **Ayr.**—DRAINAGE.—The Secretary of State for War invites tenders for the reconstruction of drainage at Ayr Barracks, in the Scottish Command. See advertisement in this issue for further particulars.

* SEPTEMBER 14.—**Bromley.**—STREET IMPROVEMENT.—The Bromley B.C. invite tenders for sewering, levelling, paving, metalling, channelling, and making good Prospect-place. See advertisement in this issue for further particulars.

SEPTEMBER 15. — **Newsham and Blyth.** — ROAD AND FOOTPATHS.—North-Eastern Railway Directors invite tenders for the construction of a road and footpaths between Newsham and Blyth, together with a subway and a footbridge. Plans, etc., can be seen at the office of the company's Engineer, Mr. Charles A. Harrison, Forth Banks, Newcastle-on-Tyne, where schedules of quantities may be obtained on personal application.

SEPTEMBER 20.—**Bermondsey.**—REPAVING.—The B.C. invite tenders for the repaving of Parish-street and portions of Great Maze Pond with creosoted wood blocks. Plans, etc., may be seen, and forms of tender obtained, on application to Mr. R. J. Angel, M.Inst.C.E., Borough Surveyor.

SEPTEMBER 29.—**Wood Green.**—WORKS OF PRIVATE STREET IMPROVEMENT.—The U.D.C. invite tenders for works of private street improvement in Brabant-road, Ellenborough-road (Sec. II.), Windermere-road (Sec. II.), and Sandford-avenue. The plans, etc., may be seen, and bills of quantities obtained, on application to the Surveyor at the Town Hall, Wood Green, upon payment to Mr. Wm. P. Harding, Clerk of the Council, Town Hall, Wood Green, of a deposit of 1*l.* 1*s.*

STONES, MATERIAL, AND STORES.

AUGUST 31-SEPTEMBER 6. — **Royton.** — STONE. — The U.D.C. of Royton invite tenders for the supply of solid rock or grit setts, kerbs, flags, and rubble stone. Specification, etc., may be obtained from Mr. Thos. Bleasdale, Clerk to the Council, Town Hall, Royton, near Oldham.

SEPTEMBER 1.—**Dublin.**—MATERIAL.—Great Southern and Western Railway Company (Ireland) Directors invite tenders for the supply of material. The specifications for the rails, fishplates, and chairs are upon separate forms, and a charge of 5*s.*, which is not returnable, will be made for each specification. Mr. Robert Crawford, Secretary, Kingsbridge Terminus, Dublin.

SEPTEMBER 1. — **London.** — STORES.—The Metropolitan Asylums Board invite tenders for the supply of builders', engineers', smiths', plumbers', and gasfitters' ironmongery and miscellaneous stores and electrical accessories. Forms of tender can be obtained at the office of the Board, Embankment, London, E.C.

SEPTEMBER 2. — **East Barnet.** — GRANITE AND GRAVEL.—East Barnet Valley U.D.C. invite tenders for supply of broken granite, gravel, hoggin, stoneware pipes, etc. Further particulars, etc., can be obtained on application to Mr. Henry York, C.E., Surveyor to the Council.

SEPTEMBER 3. — **Houghton-le-Spring.** — ROAD MATERIALS.—The U.D.C. of Houghton-le-Spring invite tenders for the supply of road materials. Further particulars, with form of tender, may be obtained from the Surveyor, Mr. John W. Holbrook.

SEPTEMBER 6.—**Bromley.**—MATERIALS FOR ROADS.—The Bromley R.D.C. invite tenders for the supply of road materials. Forms of tender may be obtained at the offices of the Council, Park House, Bromley, Kent.

SEPTEMBER 6. — **Faversham.** — GRANITE, ETC.—The Corporation of Faversham invite tenders for the supply of 300 tons (more or less) of granite or basalt, and of 45 tons (more or less) of granite or basalt chippings. No special form of tender will be provided. Mr. Allan Tassell, Town Clerk, Faversham.

STONES, etc.—*continued.*

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

SEPTEMBER 7.—**Bedford.**—BROKEN GRANITE, ETC.—The Corporation invite tenders for the supply of about 2,300 tons of broken granite, 620 tons of ironstone slag, and 500 tons of ironstone slag tar macadam for road-making. Forms of tender, etc., can be obtained on application. Mr. Hedley Baxter, Town Clerk, Town Hall, Bedford.

SEPTEMBER 7. — **Glamorgan.**—SUPPLIES.—The Committee of Visitors of the Glamorgan County Asylum invite tenders for the supply and delivery of builders' materials. Forms of tender, etc., may be obtained on application to the Clerk and Steward.

SEPTEMBER 7. — **Leatherhead.** — MATERIALS.—The U.D.C. of Leatherhead invite tenders for the supply of material and labour. Specification, etc., can be obtained at the office of Mr. J. E. Smales, Surveyor, Council Offices, Leatherhead.

SEPTEMBER 8. — **Bollington.**—GRANITE.—Bollington U.D.C. invite tenders for the supply of about 300 tons of Welsh granite macadam. Particulars may be obtained from Mr. Samuel Knight, Clerk, Council Offices, Bollington, near Macclesfield.

SEPTEMBER 10.—**Wakefield.**—MATERIALS.—Surveyor's materials for West Riding Lunatic Asylums at Menston, near Leeds; Storthes Hall, Kirkburton, near Huddersfield; Wadsley Bridge, near Sheffield; and Wakefield. Forms of tender and other particulars may be obtained on application to the Clerk to Asylums Committee, Room No. 30, County Hall, Wakefield.

SEPTEMBER 16.—**Bradford.**—STORES.—The Gas Committee of the Bradford Corporation invite tenders for the supply of stores. Form of tender may be had on application to Mr. Chas. Wood, Gas Engineer, Town Hall, and samples may be seen at Mill-street Gasworks.

SEPTEMBER 16. — **Haverfordwest.** — FIRE BRIGADE MATERIALS.—The Fire Brigade Committee invite tenders for 120 ft. of leather hose, 475 ft. of canvas hose, and one gun-metal breeching. Also six hooks and leather slings for hose carriers and two gun-metal adaptors. Further particulars may be obtained from Mr. W. Bevan, Borough Surveyor, Council Chambers, Haverfordwest.

SEPTEMBER 20.—**Dorchester.**—ROAD MATERIAL.—Tenders are invited for supply and delivery of road material. Forms of tender, etc., may be obtained from Mr. Percival T. Harrison, A.M.Inst.C.E., Borough Engineer, Guildhall Chambers, Dorchester.

Public Appointments.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*OVERSEER (PUBLIC WORKS DEPARTMENT)	Hong Kong P.W. Depart.	240*l.*, etc., per annum	Aug. 31
*ASSISTANT OVERSEERS (PUBLIC WKS. DEPARTMENT)	Hong Kong P.W. Depart.	165*l.*, etc., per annum	do.
*FOREMEN OF WORKS	Uganda Protectorate	200*l.* per annum, etc.	Sept. 6
*SANITARY INSPECTORS (TWO)	Bermondsey Borough Council	130*l.* per annum	Sept. 14

Auction Sale.

Nature and Place of Sale.	By whom Offered.	Date of Sale.
*BLDRS' AND CONTRACTORS' PLANT AND MACHINERY—At Central Wks., Belvedere-rd.	Fuller, Horsey, Sons & Cassell	Sept. 14

PRICES CURRENT OF MATERIALS.

**** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£ s. d.	
Best Stocks	1 6 6	per 1000 alongside, in river.
Picked Stocks for Facings	2 10 0	,, delivered
Flettons	1 4 6	,, at railway depôt.
Best Fareham Red	3 12 0	,, ,, ,,
Best Red Pressed Ruabon Facing	5 0 0	,, ,, ,,
Best Blue Pressed Staffordshire	3 15 0	,, ,, ,,
Do. Bullnose	4 0 0	,, ,, ,,
Best Stourbridge Fire Bricks	3 14 0	,, ,, ,,
GLAZED BRICKS.		
Best White and Ivory Glazed Stretchers	10 7 6	,, ,, ,,
Headers	9 17 6	,, ,, ,,
Quoins, Bullnose, and Flats	13 17 6	,, ,, ,,
Double Stretchers	15 17 6	,, ,, ,,
Double Headers	12 17 6	,, ,, ,,
One Side and two Ends	16 17 6	,, ,, ,,
Two Sides and one End	17 17 6	,, ,, ,,
Splays and Squints	15 7 6	,, ,, ,,
Best Dipped Salt Glazed Stretchers	10 7 6	,, ,, ,,
Headers	9 17 6	,, ,, ,,
Quoins, Bullnose, and Flats	13 17 6	,, ,, ,,
Double Stretchers	15 17 6	,, ,, ,,
Double Headers	12 17 6	,, ,, ,,
One Side and two Ends	16 17 6	,, ,, ,,
Two Sides and one End	17 17 6	,, ,, ,,
Splays and Squints	15 7 6	,, ,, ,,
Second Quality White and Dipped Salt Glazed	1 5 0	,, less than best.

	s. d.	
Thames and Pit Sand	6 6	per yard, delivered.
Thames Ballast	5 0	,, ,,
Best Portland Cement	28 0	per ton, ,,
Best Ground Blue Lias Lime	19 0	,, ,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 11s. 6d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 0d. per ton at rly. dpt.

STONE.

	s. d.	
BATH STONE—delivered on road waggons, Paddington Depôt	1 6½	per ft. cube.
Do. do. delivered on road waggons, Nine Elms Depôt	1 8½	,, ,,
PORTLAND STONE (20 ft. average)—		
Brown Whitbed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2 1	,, ,,
White Basebed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2 2½	,, ,,

STONE (*continued*).

	s. d.	
Ancaster in blocks	1 10	per ft. cube deld. rly. dep.
Beer ,,	1 6	,, ,,
Greenshill ,,	1 10	,, ,,
Darley Dale in blocks	2 4	,, ,,
Red Corsehill ,,	2 2	,, ,,
Closeburn Red Freestone	2 0	,, ,,
Red Mansfield ,,	2 4	,, ,,

YORK STONE—*Robin Hood Quality.*

	s. d.	
Scappled random blocks	2 10	per ft. cube, deld. rly. dep.
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 3	per ft. super. ,,
6 in. rubbed two sides ditto, ditto	2 6	,, ,,
3 in. sawn two sides slabs (random sizes)	0 11½	,, ,,
2 in. to 2½ in. sawn one side slabs (random sizes)	0 7½	,, ,,
1½ in. to 2 in. ditto, ditto	0 6	,, ,,
HARD YORK—		
Scappled random blocks	3 0	per ft. cube, ,,
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 8	per ft. super. ,,
6 in. rubbed two sides ditto	3 0	,, ,,
3 in. sawn two sides slabs (random sizes)	1 2	,, ,,
2 in. self-faced random flags	0 5	,, ,,

SLATES.

In. In.	£ s. d.	
20×10 best blue Bangor	13 2 6	per 1000 of 1200 at r.d.
20×12 ,, ,,	13 17 6	,, ,,
20×10 first quality ,,	13 0 0	,, ,,
20×12 ,, ,,	13 15 0	,, ,,
16×8 ,, ,,	7 5 0	,, ,,
22×10 best blue Portmadoc	12 12 6	,, ,,
16×8 ,, ,,	6 12 6	,, ,,
20×10 best Eureka unfading green	15 17 6	,, ,,
20×12 ,, ,,	18 7 6	,, ,,
18×10 ,, ,,	13 5 0	,, ,,
16×8 ,, ,,	10 5 0	,, ,,
20×10 permanent green	11 12 6	,, ,,
18×10 ,, ,,	9 12 6	,, ,,
16×8 ,, ,,	6 12 6	,, ,,

TILES.

	s. d.	
Best plain red roofing tiles	42 0	per 1000, at rly. depôt.
Hip and Valley tiles	3 7	per doz. ,,
Best Broseley tiles	50 0	per 1000 ,,
Do. Ornamental tiles	52 6	,, ,,
Hip and Valley tiles	4 0	per doz. ,,
Best Ruabon red, brown, or brindled do. (Edwards)	57 6	per 1000 ,,
Do. Ornamental do.	60 0	,, ,,
Hip tiles	4 0	per doz. ,,
Valley tiles	3 0	,, ,,
Best Red or Mottled Staffordshire do. (Peakes)	51 9	per 1000 ,,
Do. Ornamental do.	54 6	,, ,,
Hip tiles	4 1	per doz. ,,
Valley tiles	3 8	,, ,,

TILES (*continued*).

	s. d.	
Best "Rosemary" brand plain tiles	48 0	per 1000 at rly. dep.
Best Ornamental tiles	50 0	,, ,,
Hip tiles	4 0	per doz. ,,
Valley tiles	3 8	,, ,,
Best "Hartshill" brand plain tiles, sand-faced	50 0	per 1000 ,,
Do. pressed	47 6	,, ,,
Do. Ornamental do.	50 0	,, ,,
Hip tiles	4 0	per doz. ,,
Valley tiles	3 6	,, ,,
Staffordshire (Hanley) Reds or Brindled tiles	42 6	per 1000 ,,
Hand-made sand-faced	45 0	,, ,,
Hip tiles	4 0	per doz. ,,
Valley tiles	3 6	,, ,,

WOOD.

BUILDING WOOD.	At per standard. £ s. d.	£ s. d.	
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in	13 10 0	... 15 0 0	
Deals: best 3 by 9	13 0 0	... 14 0 0	
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11 0 0	... 12 0 0	
Battens: best 2½ by 6 and 3 by 6	0 10 0	less than 7 in. and 8 in.	
Deals: seconds	1 0 0	less than best.	
Battens: seconds	0 10 0	,,	
2 in. by 4 in. and 2 in. by 6 in.	9 0 0	... 10 0 0	
2 in. by 4½ in. and 2 in. by 5 in.	8 10 0	... 9 10 0	
Foreign Sawn Boards— 1 in. and 1¼ in. by 7 in.	0 10 0	more than battens.	
¾ in.	1 0 0	,,	
Fir timber: best middling Danzig or Memel (average specification)	At per load of 50 ft. 4 10 0	... 5 0 0	
Seconds	4 0 0	... 4 10 0	
Small timber (8 in. to 10 in.)	3 12 6	... 3 15 0	
Small timber (6 in. to 8 in.)	3 0 0	... 3 10 0	
Swedish balks	2 10 0	... 3 0 0	
Pitch-pine timber (30 ft. average)	4 0 0	... 4 15 0	

JOINERS' WOOD.	At per standard.		
White Sea: first yellow deals, 3 in. by 11 in.	24 0 0	... 25 0 0	
3 in. by 9 in.	22 0 0	... 23 0 0	
Battens 2½ in. and 3 in. by 7 in.	16 10 0	... 18 0 0	
Second yellow deals, 3 in. by 11 in.	18 10 0	... 20 0 0	
3 in. by 9 in.	17 10 0	... 19 0 0	
Battens, 2½ in. and 3 in. by 7 in.	13 10 0	... 14 10 0	
Third yellow deals, 3 in. by 11 in. and 9 in.	13 10 0	... 15 0 0	
Battens, 2½ in. and 3 in. by 7 in.	11 0 0	... 12 0 0	
Petersburg: first yellow deals, 3 in. by 11 in.	21 0 0	... 22 10 0	
Do. 3 in. by 9 in.	18 0 0	... 19 10 0	
Battens	13 10 0	... 15 0 0	
Second yellow deals, 3 in. by 11 in.	16 0 0	... 17 0	
Do. 3 in. by 9 in.	14 10 0	... 16 0 0	
Battens	11 0 0	... 12 10 0	
Third yellow deals, 3 in. by 11 in.	13 0 0	... 14 0 0	
Do. 3 in. by 9 in.	12 10 0	... 14 0 0	
Battens	10 0 0	... 11 0 0	
White Sea and Petersburg— First white deals, 3 in. by 11 in.	14 10 0	... 15 10 0	
,, ,, 3 in. by 9 in.	13 10 0	... 14 0 0	
Battens	11 0 0	... 12 0 0	
Second white deals, 3 in. by 11 in.	13 10 0	... 14 10 0	
,, ,, 3 in. by 9 in.	12 10 0	... 13 10 0	
Battens	10 0 0	... 11 0 0	

WOOD (*continued*).

JOINERS' WOOD (*continued*)—	At per standard. £ s. d.		£ s. d.
Pitch-pine: deals	18 0 0	...	21 0 0
Under 2 in. thick extra	0 10 0	...	1 0 0
Yellow pine—First, regular sizes	44 0 0	upwards.	
Oddments	32 0 0	"	
Seconds, regular sizes	33 0 0	"	
Oddments	28 0 0	"	
Kauri Pine - Planks, per ft. cube	0 3 6	...	0 5 0
Danzig and Stettin Oak logs—			
Large, per ft. cube	0 3 0	...	0 3 9
Small " "	0 2 6	...	0 2 6
Wainscot Oak Logs, per ft. cube	0 5 6	...	0 6 0
Dry Wainscot Oak, per ft. sup. as inch	0 0 8½	...	0 0 9½
½ in. do. do	0 0 7	...	—
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0 0 9	...	0 1 0
Selected, Figury, per ft. super. as inch	0 1 6	...	0 2 6
Dry Walnut, American, per ft. super. as inch	0 0 10	...	0 1 0
Teak per load	17 0 0	...	22 0 0
American Whitewood Planks, per ft. cube	0 4 0	...	0 5 0
Prepared Flooring, etc.—	Per square.		
1 in. by 7 in. yellow, planed and shot	0 13 6	...	0 17 0
1 in. by 7 in. yellow, planed and matched	0 14 0	...	0 18 0
1¼ in. by 7 in. yellow, planed and matched	0 16 0	...	1 0 0
1 in. by 7 in. white, planed and shot	0 12 0	...	0 14 6
1 in. by 7 in. white, planed and matched	0 12 6	...	0 15 0
1¼ in. by 7 in. white, planed and matched	0 15 0	...	0 16 6
½ in. by 7 in. yellow matched and beaded or V-jointed brds.	0 11 0	...	0 13 6
1 in. by 7 in. " "	0 14 0	...	0 18 0
¼ in. by 7 in. white " "	0 10 0	...	0 11 6
1 in. by 7 in. " "	0 12 9	...	0 15 0

6 in. at 6d. to 9d. per square less than 7 in

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £ s. d.		£ s. d.
Rolled Steel Joists, ordinary sections	7 0 0	...	7 10 0
Compound Girders, ordinary sections	9 0 0	...	10 0 0
Steel Compound Stanchions	11 0 0	...	12 0 0
Angles, Tees, and Channels, ordinary sections	9 0 0	...	10 0 0
Flitch Plates	9 0 0	...	9 10 0
Cast Iron Columns and Stanchions including ordinary patterns	7 10 0	...	8 10 0

METALS.

	Per ton, in London. £ s. d.		£ s. d.
IRON—			
Common Bars	8 10 0	...	9 0 0
Staffordshire Crown Bars, good merchant quality	8 15 0	...	9 5 0
Staffordshire "Marked Bars"	10 10 0	...	—
Mild Steel Bars	8 15 0	...	9 5 0
Hoop Iron, basis price	9 5 0	...	9 10 0
" " Galvanised	17 0 0	...	—
("And upwards, according to size and gauge.)			
Sheet Iron, Black—			
Ordinary sizes to 20 g.	9 15 0	...	—
" " 24 g.	10 15 0	...	
" " 26 g.	12 5 0	...	
Sheet Iron, Galvanised, flat, ordinary quality—			
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	15 0 0	...	—
Ordinary sizes to 22 g. and 24 g.	15 10 0	...	—
" " 26 g.	18 10 0	...	—
Sheet Iron, Galvanised, flat, best quality—			
Ordinary sizes to 20 g.	18 0 0	...	—
" " 22 g. and 24 g.	18 10 0	...	—
" " 26 g.	20 0 0	...	—
Galvanised Corrugated Sheets—			
Ordinary sizes, 6 ft. to 8 ft. 20 g.	14 10 0	...	—
" " 22 g. and 24 g.	14 15 0	...	—
" " 26 g.	16 5 0	...	—
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. to 20 g. and thicker	12 0 0	...	—
Best Soft Steel Sheets, 22 g. & 24 g.	13 0 0	...	—
" " " 26 g.	15 0 0	...	—
Cut Nails, 3 in. to 6 in.	10 10 0	...	11 0 0
(Under 3 in., usual trade extras.)			

LEAD, &c.

	Per ton, in London. £ s. d.		£ s. d.
LEAD—Sheet, English, 3lb. and up.	16 0 0	...	—
Pipe in coils	16 10 0	...	—
Soil pipe	18 10 0	...	—
Compo pipe	19 10 0	...	—
ZINC—Sheet—			
Vielle Montagne	26 10 0	...	—
Silesian	26 5 0	...	—
COPPER—			
Strong sheet per lb.	0 1 0	...	—
Thin "	0 1 1	...	—
Copper nails "	0 0 10	...	—
Copper wire "	0 0 10	...	—
BRASS—			
Strong Sheet "	0 0 11	...	—
Thin "	0 1 0	...	—
TIN—English Ingots "	0 1 5	...	—
SOLDER—Plumbers' "	0 0 7	...	—
Tinmen's "	0 0 9½	...	—
Blowpipe "	0 1 0	...	—

ENGLISH SHEET GLASS IN CRATES OF STOCK SIZES.

15 oz. thirds	2½d. per ft. delivered.
" fourths	1½d. " "
21 oz. thirds	3d. " "
" fourths	2½d. " "
26 oz. thirds	4d. " "
" fourths	3d. " "
32 oz. thirds	4½d " "
" fourths	4¼d. " "
Flute Sheet, 15 oz	3½d. " "
" 21 oz.	4½d. " "

ENGLISH ROLLED PLATE IN CRATES OF STOCK SIZES.

⅛ Hartley's	2½d. per ft. delivered.
1/6 "	2⅝d. " "
¼ "	2⅝d. " "
Figured, Oxford Rolled and "Oceanic" Glass, white	3½d. " "
" " tinted	5d. " "

OILS, &c.

		£ s. d.
Raw Linseed Oil in pipes	per gallon	0 2 2
" " ,, in barrels	"	0 2 3
" " ,, in drums	"	0 2 6
Boiled ,, ,, in barrels	"	0 2 6
" " ,, in drums	"	0 2 9
Turpentine in barrels	"	0 3 1
" in drums	"	0 3 3
Genuine Ground English White Lead	per ton	20 10 0
Red Lead, Dry	"	20 0 0
Best Linseed Oil Putty	per cwt.	0 7 0
Stockholm Tar	per barrel	1 12 0

VARNISHES, &c.

	Per gallon. £ s. d.
Fine Pale Oak Varnish	0 8 0
Pale Copal Oak	0 10 6
Superfine Pale Elastic Oak	0 12 6
Fine Extra Hard Church Oak	0 10 0
Superfine Hard-drying Oak, for seats of Churches	0 14 6
Fine Elastic Carriage	0 12 0
Superfine Pale Elastic Carriage	0 16 0
Fine Pale Maple	0 10 0
Finest Pale Durable Copal	0 18 0
Extra Pale French Oil	1 1 0
Eggshell Flating Varnish	0 18 0
White Pale Enamel	1 4 0
Extra Pale Paper	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 0
Berlin Black	0 16 0
Knotting	0 10 9
French and Brush Polish	0 10 6

PUBLISHER'S NOTICES.

Nat. Tel., 6112 Gerrard. Telegrams, "The Builder, London."

THE INDEX (with TITLE-PAGE) for VOLUME XCVI. (January to June, 1909) was given as a supplement with the issue of July 10th.

CLOTH CASES for Binding the Numbers are now ready, price 2s. 6d. each; also

READING CASES (Cloth), with Strings, price 9d. each.

THE NINETY-SIXTH VOLUME of "The Builder" (bound), price Twelve Shillings and Sixpence.

SUBSCRIBERS' VOLUMES, on being sent to the Office, will be bound at a cost of 3s. 6d. each.

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COMPETITIONS, CONTRACTS, ALL NOTICES ISSUED BY CORPORATE BODIES, COUNTY AND OTHER COUNCILS, PROSPECTUSES OF PUBLIC COMPANIES, SALES BY TENDER, LEGAL ANNOUNCEMENTS, etc., etc.

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*** Stamps *must not* be sent; but all sums should be remitted by Postal Orders, payable to J. MORGAN, and addressed to the Publisher of "THE BUILDER," 4, Catherine Street, W.C.

Advertisements for the current week's issue are received up to ONE p.m. on THURSDAY, but "Classification" is impossible in the case of any which may reach the Office after TWELVE NOON on that day. Those intended for the Outside Wrapper should be in by TWELVE NOON on WEDNESDAY.

ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before TEN o'clock on WEDNESDAY MORNING.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, etc., left at the Office in reply to advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

ADVERTISERS in "THE BUILDER" may have *Replies addressed to the Office*, 4, Catherine Street, Strand, W.C., *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage. Unused stamps are returned to advertisers the week after publication.

N.B.—The Reply Boxes are not intended for trade lists, circulars, and the like; should these be received, they cannot (if noticed) be forwarded.

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READING CASES { NINEPENCE EACH. By post (carefully packed), 1s.

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursday*. [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is stated, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted*. † Denotes *provisionally accepted*.

BARNARD CASTLE.—For erecting a new auction mart. Mr. F. H. Livesay, architect and surveyor, Newgate-street, Bishop Auckland.:—

W. Hudson	£1,228 12 11	J. Kyle & Sons, Barnard Castle*	£1,174 0 0
J. N. Walker	1,181 10 8		
R. Wilson	1,181 8 4		

BIGBY.—For making-up of roadway, etc., at Bentley Farm. Mr W. H. Buttrick, Surveyor, Scunthorpe:—

H. H. Huntsman	£546 15 10½
C. Kingsley	274 17 0
H. Roberts, Gainsborough*	210 0 0

BISHOP'S STORTFORD.—For Herts and Essex High School for Girls. Messrs. Talbot Brown & Fisher, architects, Wellingborough:—

D. W. Barker & Son	£7,062 0 0	H. Martin, Ltd.	£6,017 0 0
W. Lawrence & Son	6,624 0 0	Hacksley Bros.	5,969 12 0
S. Roberts, Ltd.	6,483 8 7	Goodman & Murkett	5,964 16 7
F. Parkington & Son	6,370 0 0	E. Brown & Son, Ltd.	5,890 0 0
Glasscock & Son	6,360 0 0	J. S. Kimberley	5,850 0 0
R. Marriott	6,321 14 5	G. Henson & Son	5,829 7 6
J. Cracknell	6,265 0 0	J. Day, Bishop's Stortford†	5,786 0 0
F. Hitch	6,227 7 4		
P. R. Paul	6,209 8 9		
Beardsmore & West	6,096 0 0		

BOURNEMOUTH.—For erecting a branch library at Boscombe, for the Public Libraries Committee of the Bournemouth Town Council. Mr. Charles T. Miles, F.R.I.B.A., Observer-chambers, Bournemouth. Quantities by the Architect:—

J. Mitchell	£4,158 10 3
W. Hoare & Sons	3,952 0 0
S. Whitaker	3,921 0 0
F. Hoare & Sons	3,849 0 0
W. Jones & Sons	3,800 0 0
A. W. Bowman	3,742 18 0
Miller & Sons	3,726 0 0
A. J. Long	3,655 0 0
Jones & Seward	3,575 0 0
McWilliam & Son	3,573 0 0
Jenkins & Sons	3,553 0 0
J. & W. Hayward	3,487 0 0
F. A. Grigg*	3,455 17 0

[All of Bournemouth.]

BOURNEMOUTH.—For new sewer on East Cliff for the Corporation. Mr. F. W. Lacey, M.Inst.C.E., Borough Engineer and Surveyor, Municipal Offices, Bournemouth:—

M. Loader, Bournemouth	£143 16 8

CARDIFF.—For renovating of Bethel Chapel and schoolrooms:—

Smith & Beddoe	£140 15 0	Tucker Bros.	£99 15 2
E. Turner & Sons	140 0 0	J. F. Maggs & Co.	97 13 0
T. R. Williams	127 17 0	J. Ashdown & Sons, 31, Leckwith-road, Cardiff*	93 10 0
C. S. Smith	118 0 0		
W. J. Gardner	114 0 0		
G. Hallett	105 0 0		
Gough Bros.	100 0 0		

CHOPWELL.—For erecting five shops, for Mr. M. F. Rupp. Mr. D. M. Spence, architect and surveyor Shotley Bridge:—

B. Rurley, Rowlands Gill, Newcastle*	£2,127

DARLINGTON.—For pulling down premises, Tubwell-row, and erecting two new shops, dwelling-house, and warehouses at rear, for the Trustees of C. North Coates. Messrs. J. J. Taylor & Minor, architects, Post Office-chambers, Darlington. Quantities by Messrs. J. P. Allen & Partners, Newcastle:—

Stairmand & Son	£1,446 10 0	T. Rodgers	£1,157 9 5
J. J. Airey	1,211 5 2	Blackett & Son	1,116 0 0
J. Guthrie & Son	1,179 13 6	Mackenzie Bros.*	1,115 10 0
Earnshaw	1,163 9 2	T. Boyd	1,107 18 3

[All of Darlington.]
[Architects' estimate, £1,100.]

DRIGHLINGTON (near Bradford).—For the erection of the "Tempest" Constitutional Club, for the Pudsey Conservative Association. Mr. Louis Ambler, architect, Temple-chambers, Temple-avenue, London. Quantities by Mr. E. C. Pinks:—

Excavator, Bricklayer, and Mason: J. & D. Thornton, Drighlington*	£520 0
Slater: T. Nelson & Son, Bradford*	63 18
Carpenter and Joiner: H. Waterhouse & Sons, Dudley-hill, Bradford*	293 0
Smith, Gasfitter, Plumber, and Glazier: A. Cooper, Drighlington*	201 10
Plasterer: J. Iredale & Son, Birstall, near Leeds*	24 10
Painter: T. Batty, Drighlington*	18 0

EPSOM.—For taking up and relaying of the drainage system of Nos. 2, 4, 6, 8, 10, 12, 14, and 16, East-street for the Urban District Council:—

J. H. Allwork, Tolworth, Surbiton*	£165

GILSLAND AND LONGBYRE.—For waterworks, for Haltwhistle Rural District Council. Mr. J. E. Parker, A.M.Inst.C.E., Post Office-chambers, Newcastle-on-Tyne:—

C. M. Skinner, Milburn House, Newcastle-on-Tyne*	£1,584

HEATON NORRIS.—For forming the carriageways of private streets with tarred granited macadam, for the Urban District Council. Mr. W. Banks, A.M.Inst.C.E., Surveyor to the Council, Council Offices, Heaton Moor, Lancs:—

The Northern Quarries Co., Ltd., Grange-over-Sands,* 3s. 8d. per sq. yd.

KEIGHLEY.—For erecting St. James's Church, Cross-roads. Messrs. J. B. Bailey & Son, architects, 3, Scott-street, Keighley:—

Mason: Waddington Bros., Oxenhope	£2,283
Joiner: M. Taylor, Lees, Keighley	
Plasterer: J. Brearley, Cross-roads, Keighley	
Slater: W. Thornton, Keighley	
Plumber: S. Binns, Haworth, Keighley	
Painter: J. Turner, Haworth, Keighley	

[The tower and heating apparatus not included.]

LONDON.—For forming new lower fronts and window enclosures at the British Medical Association premises, Strand, for Messrs. Dunn & Co. Mr. Edmund A. Fermaud, architect, 59, Denbigh-street, Westminster:—

Arnold & Sansum	£637 10	W. J. Negus	£560 0
C. Sprukley & Co.	598 0	Hibberd Bros.*	544 12
S. Jones & Co.	571 6		

LONDON.—For pulling down and reinstatement of part of the gable wall flanking into Greenwood-road, and making good at No. 121, Richmond-road, Hackney, N. Messrs. Gordon Wilson & Co., architects, 667, Fulham-road, S.W.:—

M. Calnan & Son	£84 15 0
Hicks & Co.*	75 2 0

NEWARK.—For erection of Newark High School for Girls, for the Lilley and Stone Foundation Trustees. Messrs. Brewell & Baily, FF.R.I.B.A., architects, Nottingham. Quantities by Messrs. C. Pearson Shaw, Son, & Hemingway, M.Q.S.A., Nottingham and Bingham, Notts:—

Brown & Son, Newark*	£4,445

NORWICH. — For alterations to Birchfield Farm House, for the Small Holdings Committee of the Norfolk County Council:—

E. Means	£315 0 0	A. Means	£205 0 0
Hall & Lawson	299 15 0	F. W. Ashby	203 17 6
J. Johnson	260 0 0	W. Sutton, Upwell*	190 10 0
F. Anderson	250 9 0		

NORWICH.—For erecting a cottage at St. Peter's Farm, Magdalen, for the Small Holdings Committee of the Norfolk County Council:—

F. Anderson	£318 14 9	J. Johnson	£275 0 0
Hall & Lawson	317 10 0	R. Eggleton	275 0 0
J. M. Collins	310 0 0	G. Clarke	269 18 0
W. White	307 0 0	F. Carter & Co., Lynn*	268 15 0
Meens & Reeder	304 15 3		
F. W. Ashby	289 0 0		

NOTTINGHAM.—For the erection of turning shop and latrines at Deering-street, Nottingham, for Mr. E. Jardine, of Nottingham. Mr. F. S. Antliff, architect, Draycott, near Derby. Quantities by architect:—

E. Hind	£1,967	W. Woodsend	£1,770
Dennett & Ingle	1,830	W. Maule & Co.	1,735
G. A. Pillatt	1,816	F. Messon, Bangor-street, Nottingham*	1,680
H. Vickers & Son	1,801		
T. Barlow & Co.	1,795		

PENISTONE.—For constructing a new cattle market, for the Urban District Council. Mr. H. J. Brettoner, architect, Penistone. Quantities by architect:—

Excavating, Bricklayer and Mason, Concretor: F. Eyre, Hillsbro, Sheffield*	£815 0 0
Joiner and Painter: J. Tinker & Sons, Thuristone*	107 6 5
Plasterer and Slater: G. Beard & Sons, Thuristone*	34 15 0
Plumber and Glazier: F. Tinker, Penistone*	67 3 7
Founder and Smith: C. Atkinson & Sons, Tower-street, Harrogate*	95 6 10

ST. ALBANS.—For making-up, etc., Fleetville district, for the Rural District Council. Mr. H. F. Mence, Surveyor, 11, Peter's-street, St. Albans:—

H. Williams, Waratah, Hatfield-road, St. Albans*	£293 19 10	Albion-road.
	523 4 10	Cavendish-road.
	678 5 3	Tess and Princes roads.

ST. DOMINICK.—For new porch, and alterations to the Wesleyan chapel. Mr. Lawrence Scantlebury, architect, Callington:—

C. B. James	£110	J. H. Dingle, Kelly Bray, Callington*	£98
H. J. Martin	99		

SHARLSTON.—For erecting Sunday-school, assembly-hall, etc., near St. Luke Church, Sharlston, near Wakefield. Mr. J. W. Cocking, architect, Cloth Hall-street, Huddersfield. Quantities by architect:

Bricklayers: Higgins & Pashley, Wakefield	£316 12 5
Joiner: A. W. Martin, Wakefield	330 10 6
Plumber, Heating, Roofiling: S. Atkinson, Wakefield	209 18 9
Plasterer: J. Illingworth, Wakefield	27 3 7
Painter: W. Harrison, Halton, Leeds	30 2 6
Partitions: Jeffry & Co., Batley	100 0 0

SUNBURY-ON-THAMES.—For making up Sunmead-road, for the Urban District Council. Mr. H. F. Coales, Surveyor, Council Offices, Sunbury:—

Parton & Co.	£488 9 0	W. Wilson	£309 17 6
Hayes & Co.	396 0 0	S. Kavanagh & Co.	289 18 4
H. V. Smith & Co.	378 18 10	A. T. Catley	286 0 0
Dykes	373 13 7	G. Hebburn	270 2 10
R. W. Swaker	321 19 0	Dyall, Lear, & Co.	259 10 0
T. Free & Sons	321 18 8	E. Parry & Co., Howard's-lane, Putney*	236 17 4
Lane & Co.	311 17 0		

SOUTHALL.—For erecting St. John's Church, Southall, Middlesex. Mr. Chas. G. Miller, architect, 65, Chancery-lane, W.C.:—

Stephens, Bastow, & Co., Ltd., Bristol*	£7,697

SHEFFIELD.—For the erection of the Training College Hall of Residence for men, and for the heating and electric lighting, for the Education Committee. Messrs. Gibbs & Flockton, architects, 15, St. James-road, Sheffield:—

E. & W. Oxley	£14,180 0 0
Dawson, Jones, & Co.	13,998 0 0
G. & D. Sheldon	13,720 0 0
J. Fidler, Ltd.	13,679 0 0
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W. & A. Forsdike	12,290 0 0
J. Longden & Son	12,200 0 0
B. Powell & Son	12,110 0 0
J. Eshelby	12,049 0 0
H. Freckingham & Sons	11,895 0 0
T. Roper & Sons, Sheffield*	11,890 0 0

TOWCESTER.—For alterations and additions at the infants' school, for the Managers of the Church of England schools. Mr. J. T. Blackwell, architect, 53, High-street, Kettering. Quantities by architect:—

Sturgess & Sons	£670 0	T. Higgs	£490 0
W. W. Webster	540 0	J. Bentley & Co.	477 0
T. Heath, Ltd.	515 0	Beardsmore & West	459 0
E. Green	510 0	Smith & Bunning	429 0
G. Haddon & Co.	502 0	T. Hickman, Market Harborough*	419 19
Holland & Marks	497 15		
T. Wheeler	495 0		

UXBRIDGE.—For additional lavatory accommodation at the Workhouse, for the Guardians. Mr. W. L. Eves, Surveyor, 54, High-street, Uxbridge:—

H. E. & G. Pratt	£129 0 0
J. S. Brown	107 5 0
W. G. Stone, 4, The Parade, Station-road, West Drayton*	92 16 0

WEASTE (Manchester).—For adding north and south aisles, and seating the Victoria Memorial Church, Weaste, Manchester. Mr. E. H. Lingen Barker, architect:—

Trask & Sons	£1,650	Hatch & Son	£1,346
Carlyle	1,567	Ridyard	1,302
Gerrard & Son	1,560	Clayton Bros.	1,300
Thorpe & Son	1,390	Greenhalgh & Co.	1,289

WINTON.—For tar-paving works, Wimborne-road, for Bournemouth Corporation. Mr. F. W. Lacey, Borough Engineer and Surveyor, Municipal Offices, Bournemouth:—

Grounds & Newton, Bournemouth, 7½ per cent. below the prices set out in the schedule to the tender.	

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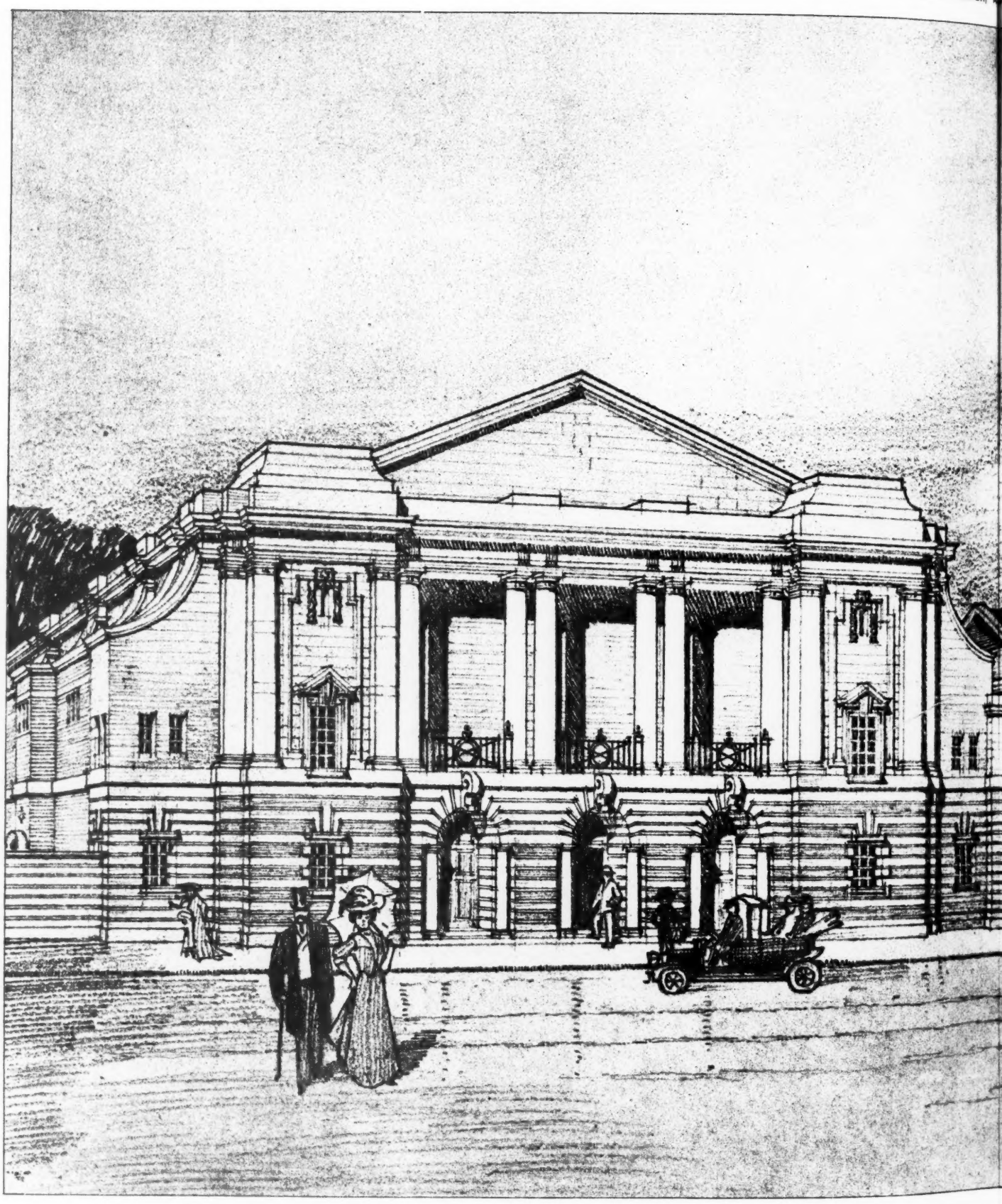

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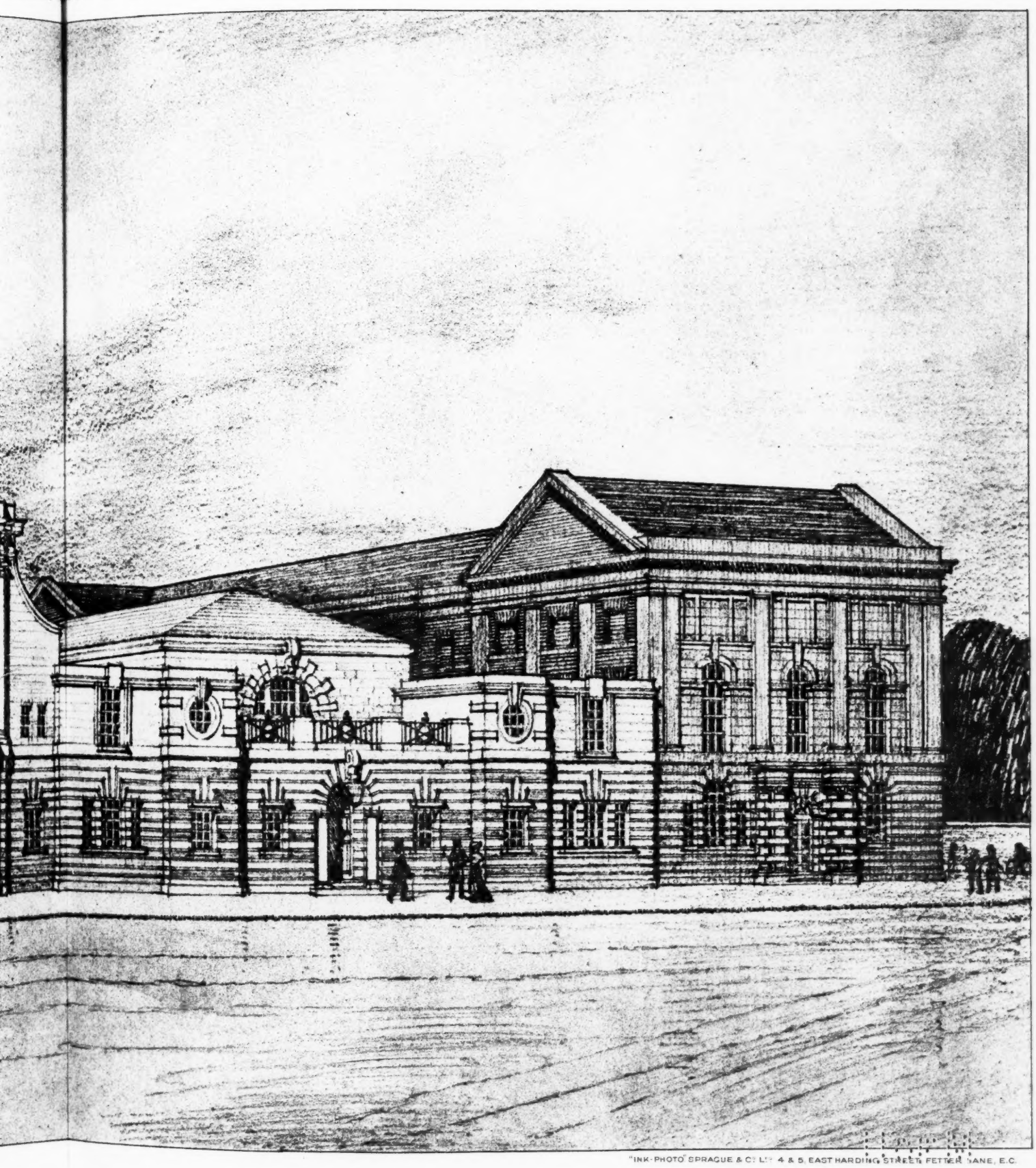

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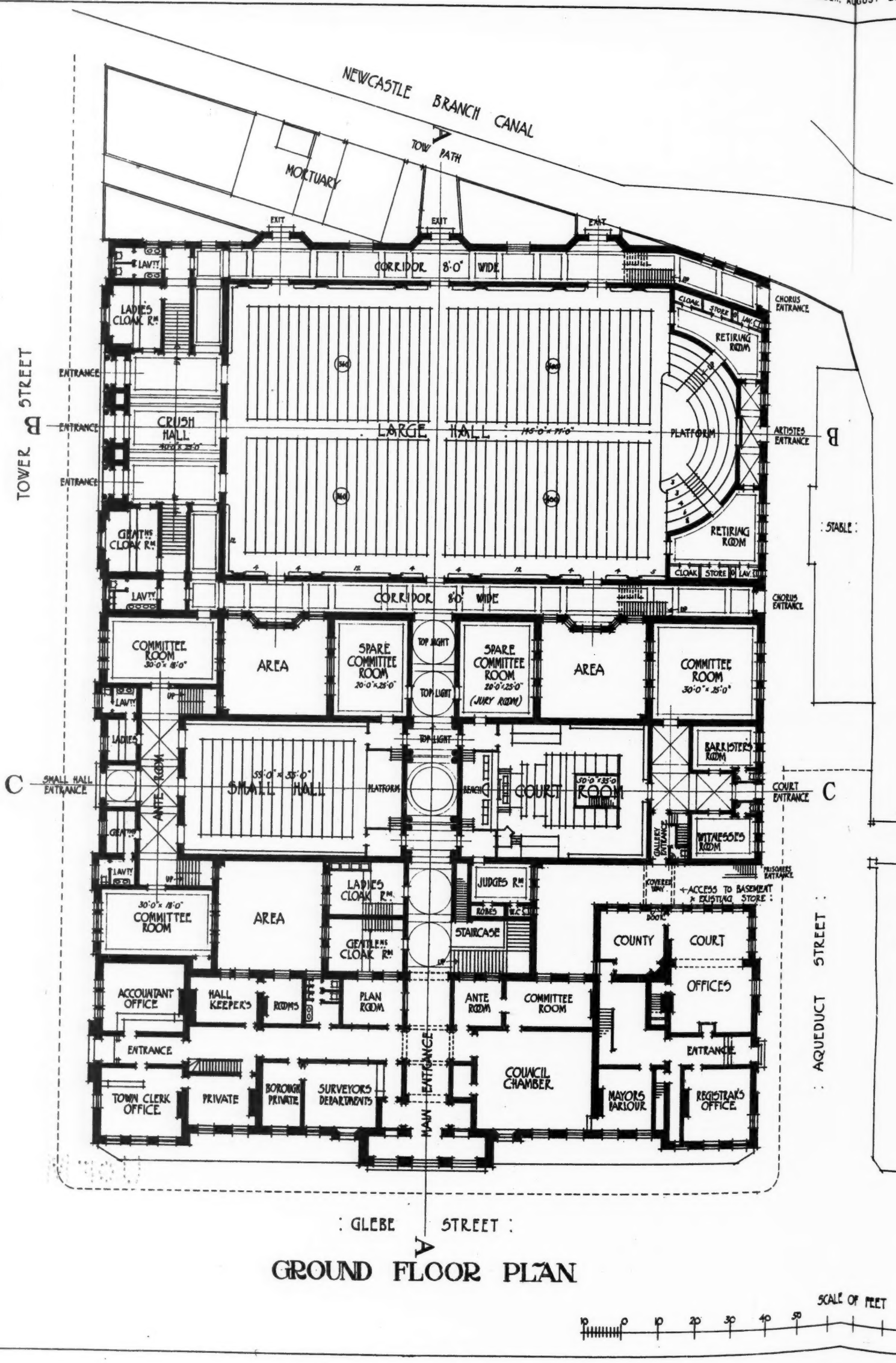
PLACED SECOND BY THE ASSESSOR.)



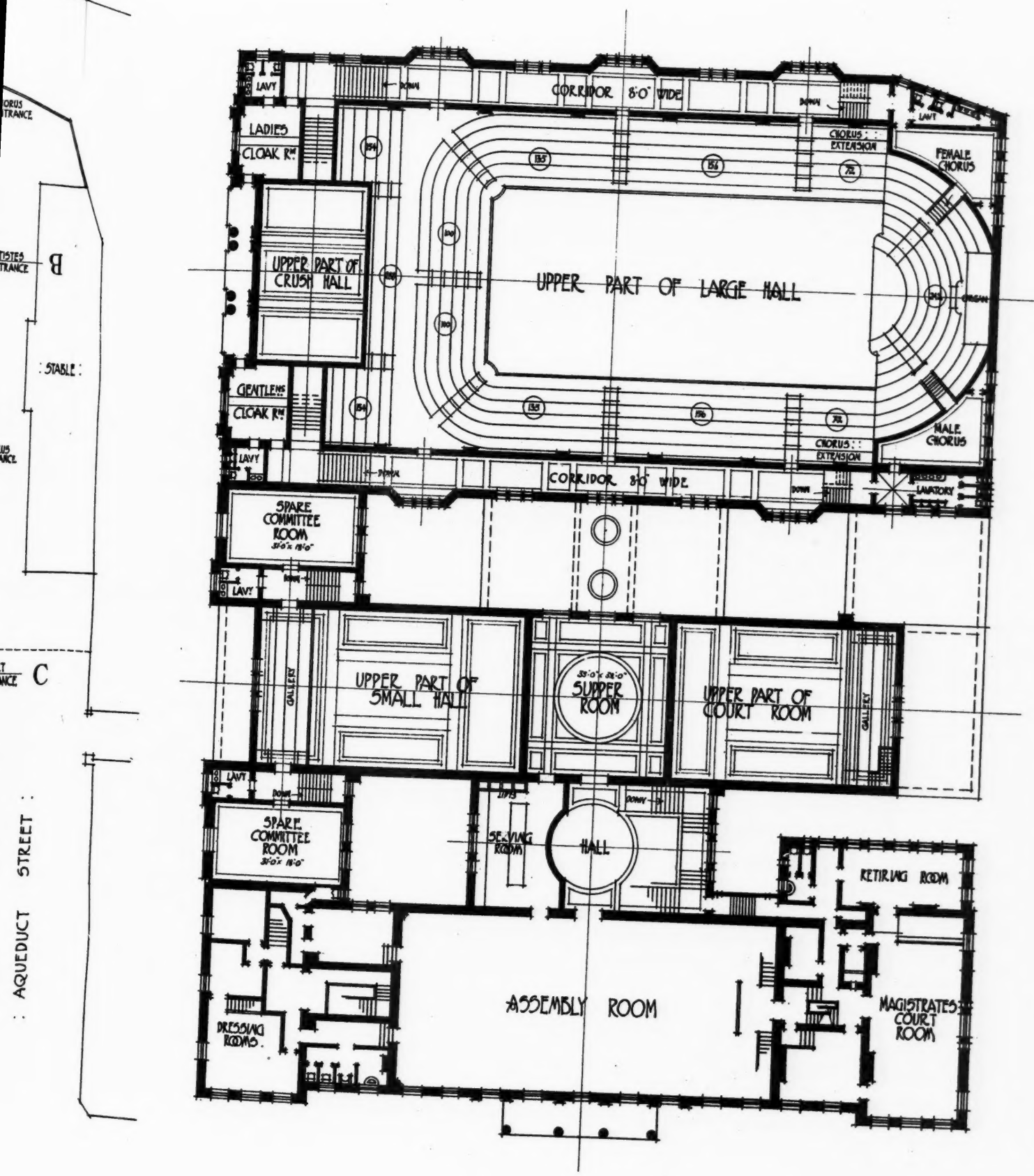
GROUND FLOOR PLAN

SCALE OF FEET

10 0 10 20 30 40 50

COMPETITION DESIGN, ADDITIONS TO THE TOWN HALL, STOKE-U

(DESIGN PLACED SECOND BY THE ASSES



FIRST FLOOR PLAN

VN HALL, STOKE-UPON-TRENT.—By Messrs. Warwick & Hall.

SECOND BY THE ASSESSOR.)

PHOTO-LITHO. SPRAGUE & Co L.D. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

PERSPECTIVE
VIEW

PHOTO-LITHO. SPRAGUE & Cº L.ᵀᵈ 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

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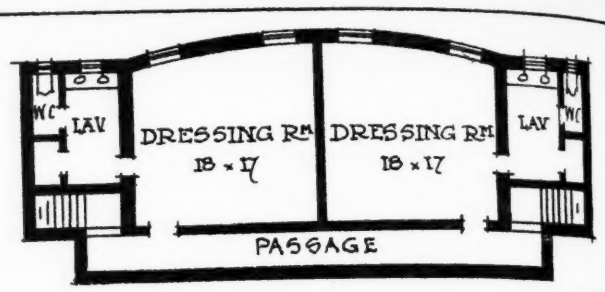
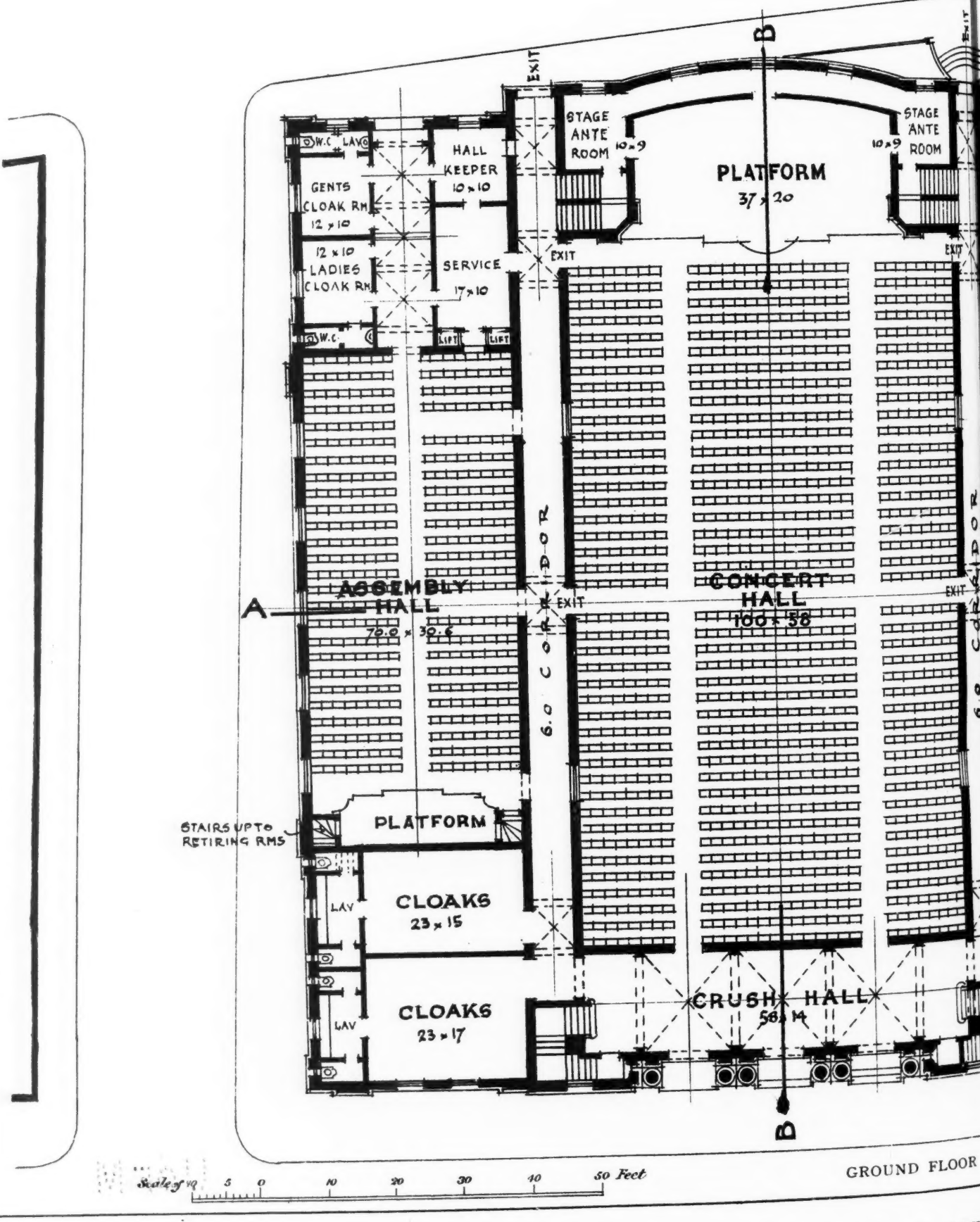
PERSPECTIVE VIEW.



UNDER STAGE



GROUND FLOOR PLAN.

SECOND PREMIATED DESIGN FOR PROPOSED MUNICIPAL BUIL

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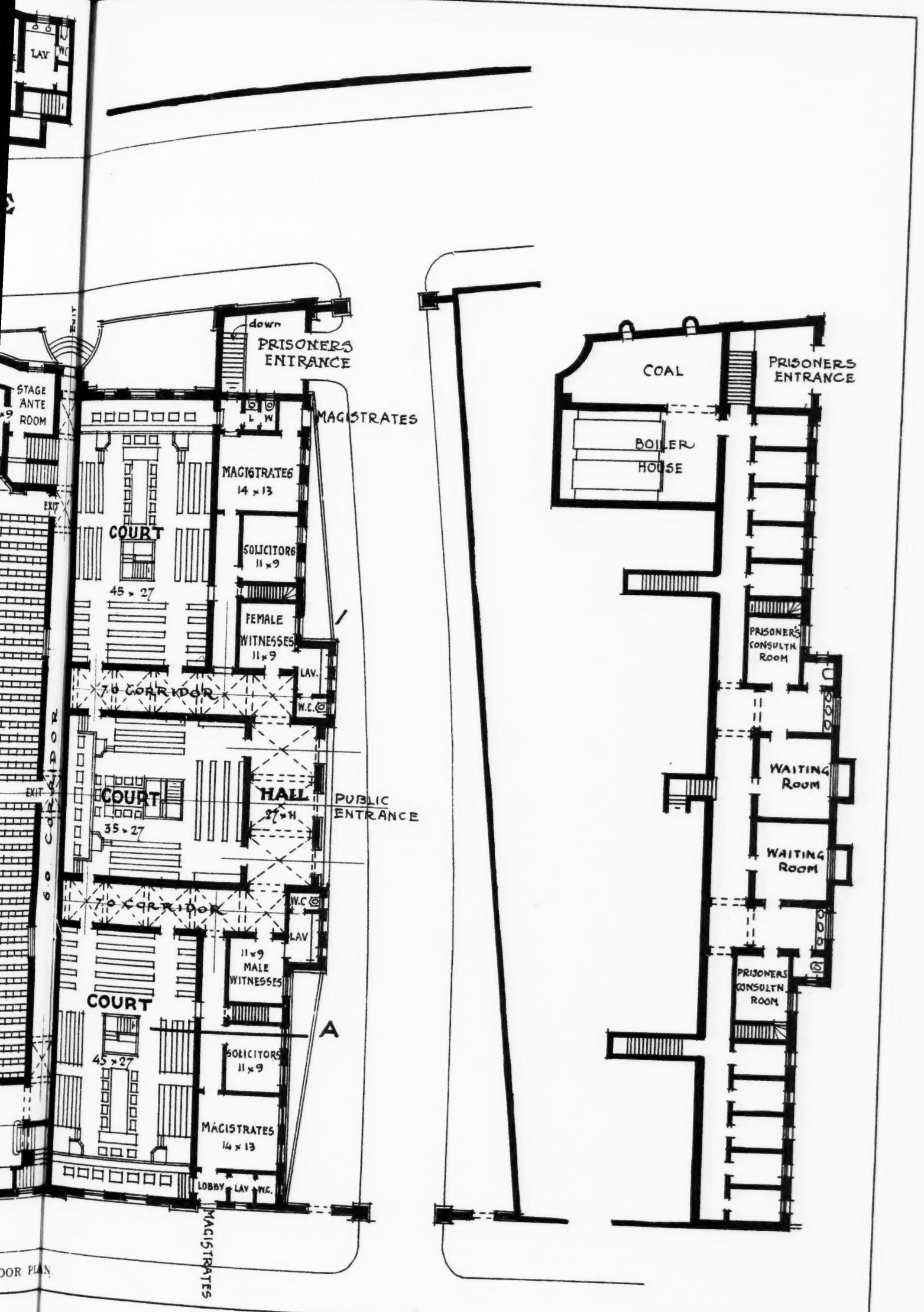

OOR PLAN.

UNICIPAL BUILDINGS, BURSLEM.—By Mr. E. Montague Thomas.

PLANS.

PHOTO-LITHO. SPRAGUE & Co^y L^d. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

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Toledo.

PUBLIC interest in the fate of Toledo Cathedral has been aroused of late by reports in the daily papers that the vaulting of the central portion threatened collapse, and by the photographs published in a recent number of the *Graphic*. These rumours are fortunately, however, somewhat exaggerated and unfounded.

The original construction of this immense five-aisled church was evidently as defective as was often the case with XIIIth-century buildings elsewhere. The original design of the vaulting of both nave and transepts follows a very depressed pointed curvature, little more, in fact, than a semicircle; and as a consequence of the spreading of the main supports owing to defective foundations or site, a serious deformation of the arch-ribs and of the vaulting generally has been produced. These deformations, which are specially noticeable in the nave and in the south transept, give an unfortunate look of insecurity to the interior. In places attempts have been made to strengthen the vaulting-ribs by tying them into their places with numerous iron straps on their undersides, and with bolts passing through the masonry of the vault. In some cases the vaulting-ribs must have been originally built detached from the vaulting in the earlier style of such construction, and this has allowed of their shifting in a dangerous manner. For the present the iron straps and bolts which have been from time to time applied are apparently considered sufficient, but any further movement in the structure will certainly involve a more radical "restoration" of the whole vaulting over the central aisles of the church.

One portion of the cathedral seems to be considered in a somewhat dangerous condition—this is the "puerta de los leones," or south transept front. The "puerta de los leones" is a singularly designed feature of the church, and it has evidently been reconstructed at different periods, possibly on account of defective foundations. As originally built in the XVth century, it consisted of a great archway of deeply-recessed mouldings covered with early flamboyant carving, the great lintel being supported in the middle with the usual "trumeau." Towards the interior the doorway is flanked on either side by a niche containing a sarcophagus, that on the north having been reconstructed in the "plateresque" style, in combination with an elaborately decorated gallery containing an organ which fills up the inner space of the south transept front. The exterior façade is of the XVth century up to the top of the main arch, but above that level an XVIIIth-century imitation of Gothic detail covers the wall. The original design of this entrance is usually attributed to a German, known as Juan Allemann.

The "puerta de los leones" is now boarded up for fear of falling masonry, although the appearances outside are not very alarming. Within the church at this point a serious crack extending from side to side of the central vaulting seems the most suggestive evidence of impending ruin. It is to be hoped that this settlement, which must have been in progress for ages, has at last reached its limit, or little can be done without more or less rebuilding this portion of the church at some future date. The site on which the cathedral is built is highly unsatisfactory as a foundation; the city crowns a rocky hill of which the strata have evidently a tendency to slip.

Some recent Press notices have gone so far as to state that the superb stall work of the "Coro" and other portions of furniture beneath the central crossing of the cathedral have already been removed, anticipating an accident in event of an earthquake. This is, however, quite incorrect; no immediate cause for alarm seems to be felt by the clergy, who continue to conduct their services as in times past, and all cause for apprehension of immediate danger seems to have been removed by timely measures and repairs to this central portion.

Externally Toledo Cathedral is particularly picturesque. Its position, embedded in a mass of more or less ancient buildings intersected by tortuous lanes, prevents any general view of its mass—which is very considerable—but, notwithstanding this, a great impression of its size is obtained in consequence of the innumerable side views and "bits," which are always presenting themselves to the visitor. The west end stands in a small, irregular "plaza," which affords a charming setting for the unfinished outlines of the building. The west front displays the curious Germanisms of the Spanish style of the XIVth and XVth centuries, features due, as is generally supposed, to the presence of actual Germans as designers and craftsmen in the peninsula at this period. The central feature of this west front is a curiously designed upper story, which seems to be a sort of *replica* of the famous triangular porch at Ratisbon.

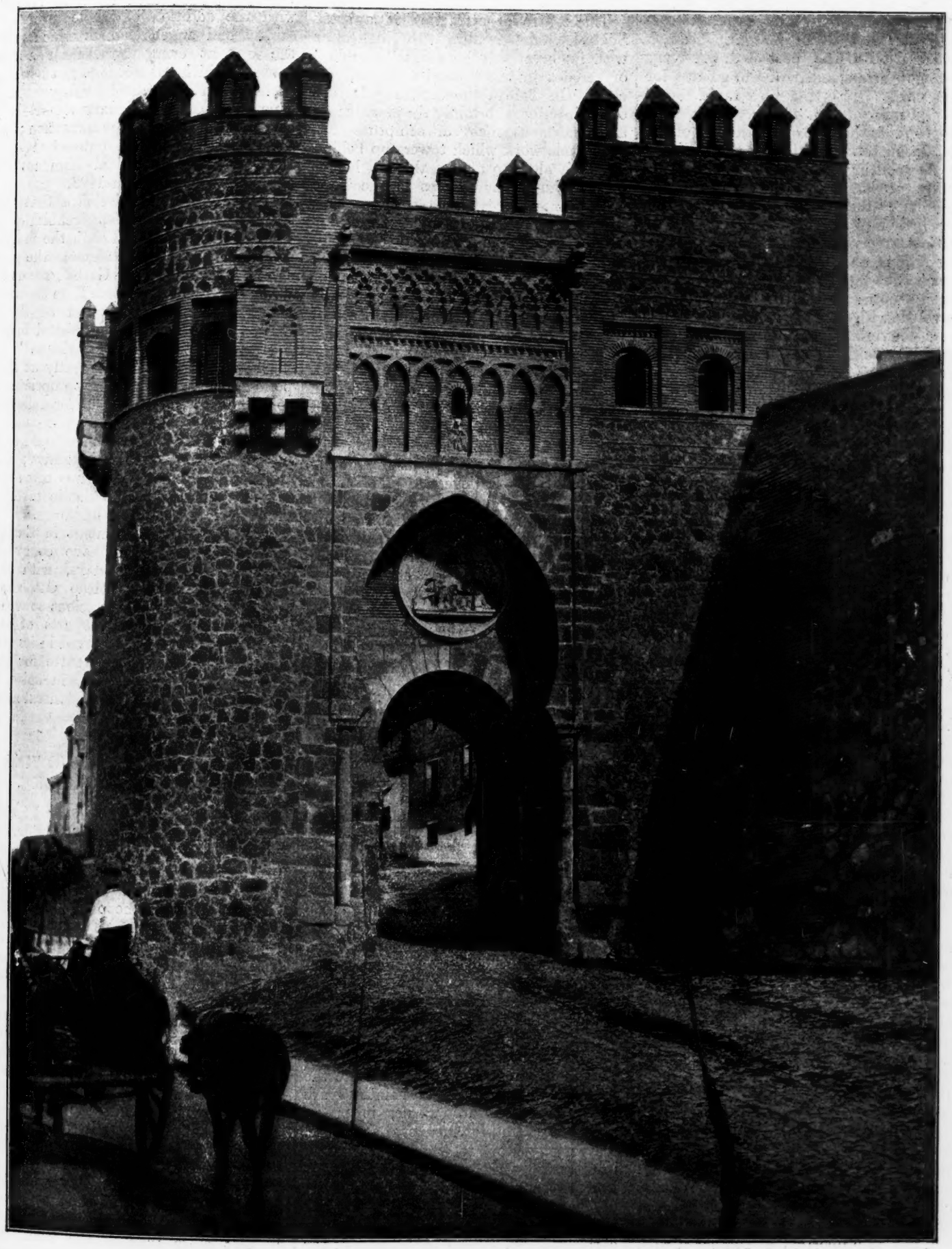
Berruguete, Herrera, Churriguera are the names of the principal architects of the classical Renaissance in Spain. "I cannot indeed forgive these men by whom the exterior of this church was completely modernised or concealed by their additions," says George Edmund Street in his book on the "Gothic Architecture in Spain." We of a later age may perhaps afford to be a little

more indulgent to the authors of a style so repugnant to the sensitiveness of an enthusiast of the "Gothic Revival." Street, in his sweeping condemnation of anything connected with the "classic" styles, seems to have forgotten that much of the work so offensive to him is merely the completion of what had been left unfinished at some earlier period. The large south-western tower of the cathedral was, for instance, unfinished till the XVIIth century, when the elegant octagonal dome was designed as its termination by an architect, apparently of Greek origin, named George Theotocopoulo. The additions or works of completion so much deplored by Street are certainly sufficiently out of harmony with the genuine Gothic work, but they have some degree of interest when compared with our own "Gothic" buildings designed by Wren or Horace Walpole. The Spanish work is indeed somewhat more true to the ancient principles of construction than "Tom Tower," Oxford, or the west front of Westminster Abbey. This survival of a more genuine feeling for mediæval types of design and workmanship may be noticed in many of the great Spanish buildings of the XVIth-XVIIIth centuries; in England it may be paralleled with the lingering of mediæval details in farm buildings in out-of-the-way districts.

One of the most interesting references to Toledo Cathedral in Street's book is his description and diagrams of the design and construction of the vaulting

The Cathedral, Toledo.

over the ambulatory which encircles the east end of the choir. As originally planned, the choir was intended to be encircled by nine large chapels and eight smaller chapels or recesses filled by doorways in some cases. This arrangement, which seems to have become a favourite one with Spanish architects, appears to have originated in such imitations of early French buildings as the Cathedral of Santiago, with its five large chapels and intermediate doorways around the chevet. This plan was adopted in order to avoid the difficulty in carrying the ordinary square vaulting of an aisle round a semicircular or polygonal apse, due to the difference in the curvature of the ribs, etc. By treating each large chapel as equal in width to the corresponding arch of the choir arcade the intervening space of the ambulatory was easily covered with a square vault. The intermediate triangular space between each small chapel and the pier of the choir arcade resulting from this disposition is not difficult to provide with a vault of three ribs, one starting from the pier of the choir, and the other two carried up from the wall shafts at the angles of the large chapels. In this way the distorted effect sometimes noticeable in vaulting constructed round a chevet



The Puerta del Sol, Toledo.

is avoided, and the construction is both sounder and more pleasing to the eye.

The ingenious planning of the lead work and guttering in the external covering to the immense area covered by Toledo Cathedral affords a special theme for architectural study. Most of the Spanish cathedrals are remarkable for their immense width. Toledo is close upon 200 ft. in width and nearly 350 ft. long, and the rainfall on this area of 70,000 ft. has to be provided for in the mediæval manner with lead gutters and gurgoyles, and any defect in the system would mean rapid destruction of the shell of masonry beneath which has to be protected. A very common arrangement of the gutters for the purpose of giving more rapid course to the rain-water is to carry them from upper roofs through or on the top of the flying buttresses to a convenient gurgoyle spouting into some neighbouring street or lane, and thus prevent the flooding of the lower roofs. Snow enters but little into the calculations of builders in Central Spain, although in the northern mountains and Galicia the winters are much the same as in the rest of Europe. Such enormous square areas as are covered with roofing in the cathedrals and converted mosques of the South would certainly have never come into existence but for this freedom from water in its more penetrating form.

Toledo Cathedral more than most other buildings of its type impresses the visitor with the fact that it was built primarily for internal use and display. The mediæval city crowded within its natural defences of precipitous cliffs, around which the River Tagus has cut in the course of ages a mighty fosse, afforded no area on which to display the usual external proportions of a Gothic cathedral. The irregular nature of the rocky hill on which the city is built also prevents the building from being distinguishable at a distance amongst the masses of crowded dwellings and lesser monuments which rise in picturesque confusion around and above it. The cathedral has consequently grown into existence as a vast interior, out of which lead many smaller—but only comparatively smaller — churches. These smaller churches, sacristies, etc., are almost completely without architectural exteriors, and, as already remarked, very little of the cathedral seems to have been completed externally till the days of the classic revival so much reviled by Street.

The general design of the interior—attributed to a certain Pedro Pérez, who seems to have superintended the work during the fifty years, 1225-1275—is of a mediocre, uninteresting character, allowing of but little criticism. Founded upon French models of the period, it does not display any particular originality. The nave, choir, and transepts, with their double aisles, seem all to have been completed from one design, and the original construction has been preserved intact in spite of the extensive alterations to the exterior of the cathedral occasioned by the addition of immense chapels on different sides. The general effect of the interior is somewhat heavy and low in proportion as compared with the soaring character of contemporary French work; the piers of the nave arcade, with their attached vaulting shafts, are needlessly massive, and the small importance of the triforium and clearstory adds to these defects. The window tracery is of the usual beautiful geometrical style which the Spaniards seem to have appreciated almost till the last days of the *moyen age*—a style which lends itself to the splendours of Flemish glass with which almost all the windows of the cathedral are glazed—but the mason-craft is of a very ordinary description.

The centre of attraction in a great Spanish church is always the high altar with its invariably gorgeous "retablo" or reredos in the "Capilla Mayor," or choir. In Toledo the crowning feature of the interior is certainly the magnificent and enormous mass of sculpture and tabernacle work which towers up behind the high altar to almost the full height of the church, and closes in the three eastern bays of the choir apse. This prodigious piece of wood-carving is attributed to the combined efforts of half a dozen artists, several of whom are said to have been Germans or Dutchmen. Its five stories of compartments are filled with figure sculpture of a type somewhat later than the Gothic tabernacle work enshrining it, but the single figures of saints half life-size at the sides are of the finest mediæval character. The whole retablo is gilded and, as Street says, "of extreme richness and perfect quietness combined, the usual result of the ample use of gold." Street does not, however, lay stress upon a very curious use of gilding in this connexion. Spanish church interiors are singularly devoid of mural paintings, although the architectural features of capitals, cornices, bosses, etc., are frequently treated in polychrome decoration. In the case of the "Capilla Mayor" at Toledo the tiers of magnificent tombs, which rise one above another on either side of the retablo, are decorated in all the splendour of coloured heraldry, and in addition the jointing of the stonework throughout the choir is also gilded. In other words, the masonry appears as if set with a broad mortar joint of gold! Such a treatment is perhaps almost unique, and certainly belongs to the period of the retablo, 1498-1504. Was the designer of such a decoration aware of the gilded streak in the lead jointing of certain Greek temples, or was the gold-leaf used thus lavishly at Toledo the first fruits of plunder offered by the Spanish conquerors of America, who are sometimes said to have soothed their consciences by gilding these immense "retablos" in other Spanish churches? Whatever may have originated this singular mode of decoration, it is certainly highly decorative, and on the whole satisfactory in a case like the present, where no mural paintings are attempted—in other words, it is an excellent setting for mediæval sculpture.

Every visitor to Spain is greatly impressed by the magnificent wrought-iron screens which still remain in front of the altars of the "Capilla Mayor," as well as of the side chapels in every cathedral. At Toledo the screens of the "coro" and of the "Capilla Mayor" are stupendous examples of the class, over 30 ft. in height; that in front of the high altar forming also a rood-screen with a colossal crucifix above it. The effect of the richly-decorated sanctuary seen through this screen, with the remarkable treatment of gilded masonry above described, is perhaps unique in Christendom—it seems the *nec plus ultra* of sumptuous ecclesiastical art. The extreme minuteness of detail, the wealth of imagination displayed in endless combination of mouldings and variety of sculptured forms in leafage, with the addition of whole armies of saintly and angelic figures which meet the eye at every turn, form a *tout ensemble* which has never been surpassed probably in the whole history of art. This remarkable sanctuary stands in a condition of singular preservation; we seem to see it almost untouched since the days when Cardinal Ximenes set about its completion in 1498.

It is of interest to remark that this same Cardinal Ximenes, Archbishop of Toledo, who is credited with the magnificence of his cathedral choir in the pure style of XVth-century Gothic, seems to have built about the same time the very beautiful foundling hospital of Santa Cruz, also in Toledo, a delightful building in the early "plateresque" or "goldsmith's style." Evidently at that period it was considered appropriate to continue the pointed style for religious monuments, whilst the new-fangled paganism of the Renaissance could only be permitted in secular buildings; and this, it must remembered, was often the full development of the classic taste in Italy in both classes of buildings.

Few mediæval monuments in Europe can compare, or can have compared even in their palmy days, with the splendid interior of Toledo Cathedral. Long may it remain a precious souvenir of the absolutely extinct arts of the Middle Ages, and be preserved in its still comparatively unrestored state for the admiration of future ages, in spite of rumoured collapse and threatening earthquakes.

A PLEA FOR THE FURTHER SUPPRESSION OF SMOKE.

THE time has surely arrived for the inhabitants of large residential towns to call upon the legislature for better protection of the atmosphere from pollution with coal smoke. Cheap electricity, cheap gas, and solid smokeless fuel in various forms are now available for domestic heating and for factory purposes, and neither crass selfishness on the part of manufacturers nor foolish apathy on the part of many householders should prevent the more intelligent portion of the community from insisting upon more drastic action being taken to suppress the smoke nuisance. For a little while longer the discharge of smoke into the atmosphere must, perhaps, be permitted in certain cases, but if the importation of smoke-producing coal into London were at once prohibited no industry would be ruined, save that of the chimney sweep, and no householder need suffer from lack of heat more than in the past. The coal-merchant would have to become a

purveyor of smokeless fuel. Already the poorest classes are extensively using gas and broken coke in place of coal; already the wealthier classes are extensively using electric radiators and gas-fires in offices and bedrooms; already the three metropolitan gas companies have 700,000 gas-cookers being used by their customers; already electric motors and gas-engines are being extensively and profitably used for power purposes; and we know no reason why the unprogressive should be allowed to continue to poison the atmosphere and befoul the property of the general community. If any man wishes to generate coal smoke for his individual gain or pleasure let him be compelled to confine the smoke to his own premises and not be permitted to discharge it into the public air store.

Pollution of the waters of the Thames with soot or tarry compounds is forbidden; pollution of the atmosphere with these same matters is permitted. Why? Pollution of the atmosphere is more prejudicial to the health of the community than pollution of the river. In neither case can pollution be entirely stopped, but in both cases heavy penalties can be inflicted for unnecessary pollution. Yet from houses innumerable unnecessary pollution of the air is carried on with impunity.

It has been said that it is impracticable to forbid householders to use smoke-producing coal, for it is the cheapest fuel and makes the most cheerful fire, and all attempts which have been made to prevent its use have failed. These facts may have been sufficient excuse for the universal use of bituminous coal during the Victorian era, but the introduction of such smokeless fuels as "coalite," "carbo," and other forms of inflammable coke, and the adaptation of electricity and gas to all the purposes for which bituminous coal was formerly used, make it desirable that we should now reconsider the position. The new solid smokeless fuels burn in an open grate freely and with a certain amount of flame, but in the opinion of some people a fire fed with bituminous coal remains the most satisfactory. The question which the community has to decide is whether those who wish to pollute the atmosphere with coal smoke, for the sake of a little increased personal satisfaction or a slight monetary economy, shall be permitted to do so at the expense of those who are willing to make some small sacrifice for the commonweal, or who do not agree that a smoking fire is the only satisfactory agent for heating a room.

We are well aware that ever since bituminous coal became a popular fuel there have been individuals who have recognised the barbarity of fouling the atmosphere with smoke, and who have endeavoured to bring about an abatement of the nuisance, and that in recent years some have set a good example by abandoning the use of smoke-producing fuel in their own residences; but we do not know whether the smoke-reformers yet have the goodwill of the majority. It is merely a matter of education. Future generations will look back with amazement to the time when men lived in an atmosphere rendered murky and sulphurous by their own handiwork.

The strenuous work of the Coal Smoke Abatement Society and of kindred associations has resulted in a great diminution in the quantity of soot emitted from factory chimneys, for these societies have repeatedly induced a lethargic Local Authority to take action against an offender and secure an abatement of a smoke nuisance. Further progress has been effected by encouraging the use of grates designed to burn coal without producing so much smoke as would be formed by burning the coal in a grate of common construction, but the smoke emitted even from houses fitted with the best of modern open grates is still very objectionable when ordinary house coal is burned.

The Smoke Abatement associations have also done good work in continually clamouring for reform and never allowing the evil wrought by coal smoke to be forgotten. The London County Council has also assisted in effecting an abatement of the nuisance, and we observe with satisfaction that the Council appears disposed to take more vigorous action in the immediate future. But the circle of smoking fires already extends beyond the confines of the county of London and seems destined to widen until it touches the sea. London has already lost its right of way to the fresh air, and is being choked by an ever widening belt of smoke.

Houses, factories, and steamboats are not the only offenders. Black smoke continues to be poured forth from many railway locomotives, and if there is no prospect of electricity being used on these in place of steam it will be necessary to consider whether it is not practicable to insist upon the use of some form of smokeless fuel under locomotive boilers.

The time is ripe for a great popular movement in favour of the suppression of smoke. As an initial step a Committee composed of representatives of all the learned and technical societies, and all the medical and sanitary societies, might be formed to consider the matter and to approach Parliament when the Committee had agreed upon the clauses to be inserted in a new Smoke Suppression Bill. But the work must not be left to a select few. Public support is necessary.

Every householder can personally further the good cause during the approaching winter by using smokeless fuel as a substitute for smoke-producing fuel where and when possible. If a considerable section of the community will voluntarily abstain from producing smoke it will become evident that it is not impracticable to enforce abstention on the part of others, and it will be more easy to induce the legislature to take action to bring about the desired reform.

Reconstruction of Glasgow Royal Infirmary.—The plans in connexion with the Royal Infirmary, which were recently passed at Glasgow Dean of Guild Court, are for the second instalment of the main building, now in course of erection. The portion already erected comprises about two-thirds of the surgical block, the remaining third being embraced in the portion now about to be proceeded with. In addition to this it comprises the central block, which contains the administrative department and department for special diseases. Mr. James Miller, A.R.S.A., Glasgow, is the architect for the building.

NOTES.

Housing and Town Planning Bill.

In opposing the now rejected clause providing for a quinquennial register of somewhat formidable and distinctly inquisitorial character, Mr. Burns paid a just tribute on Monday last to the valuable work done by medical officers of health and sanitary inspectors in this country. Notwithstanding the strict official discipline prevailing in Continental cities, the fact is that places like Paris and Berlin, for example, are not by any means good models for imitation in respect of sanitation. People who pay flying visits to the Continent are naturally impressed by things seen in the main thoroughfares and open spaces through which they are personally conducted by various tourist agencies. But the same people learn practically nothing of the evil-smelling back streets and the still more odorous tenements occupied by the lower classes. Mr. Burns, who has evidently spent some time in exploring the slums of Paris and Berlin, was quite right in advising the House not to take the procedure of those cities as examples worthy of following in sanitary work. So far as externals are concerned, however, we have still a good deal to learn from Continental nations, or, if not ignorant in this respect, we have at any rate ample scope for the practical application of our knowledge.

The Budget and Building.

An architect sends us the elevation and plans of a large and important country house of considerable originality of design, and writes:—"The drawings were finally approved by my client and I hoped they would have materialised some time since, but the appearance of the Government Socialistic Budget has finally decided my client to abandon the work. Thus several thousands of pounds are withheld from the building industry." This may serve as one reply to the letter of our correspondent "Alpha" some weeks ago.

Loads upon Rocks and Soils.

In the *Journal* of the Royal Institute of British Architects a letter from the Honorary Secretaries to the Science Committee invites members to send notes furnished by actual experience as to the safe loads that can be imposed on different kinds of rock and earth. We have no doubt that most architects could furnish particulars of the kind, but whether the data so rendered available would do much to advance scientific knowledge is a matter very much open to question. Members of the profession rarely find it necessary to make trial borings of elaborate character, or to enter upon close calculations of the bearing power of the strata upon which buildings are erected. Of course we fully admit that they always take care to obtain sufficient information to obviate the risk of inconvenient or disastrous settlement, but we consider the actual factors of safety generally prevailing are so ample as to make notes of the precise kind desired by the Science Committee somewhat rare. In important engineering structures, such, for instance, as bridges where enormous

loads have to be carried on piers of relatively small dimensions, exact data are always necessary. Consequently an appeal to members of the Institution of Civil Engineers would doubtless be productive of results such as those now desired. We hope, however, that the present invitation will meet with a general response, and particularly that those architects who are also civil engineers or whose practice is akin to engineering will place at the disposal of the Institute all the available data in their possession.

The Daylight Saving Bill.

THE Select Committee appointed to report on the Daylight Saving Bill have reported adversely to the Bill. In other times legislation such as that proposed by this Bill would have been treated as a joke, and have merely furnished material for the comic papers, but nowadays it is never safe to predict what measure is too fantastic to find a place on the Statute Book. When the Select Committee of 1908, which favoured the Bill, reported against the adoption of central-European time, the question was rendered wholly impracticable with no possible attendant advantages. The establishment of a universal time on the Continent and here would have had something to recommend it, but the suggestion of two different times in the year was a practical impossibility. If people desire to get up a little earlier in the summer months they can well do so without requiring legislation to assist them, and (which is equally important) without the risk of their being called upon to work longer hours in consequence.

Motor Traffic and Public Health.

THE annual Report of Dr. Fremantle, the Medical Officer of Health for Hertfordshire, deals at some length with the physiological aspects of modern highway traffic. The "nerve tension" induced by swiftly moving vehicles is more or less harmful, its intensity varying with the temperament of the subject. It is said to be far higher in women than in men, and in persons of moderate intelligence than in those of much or very little. Still more evident than mental influences are the material factors of noise, smell, and dust. The first two annoyances are being reduced year by year, and will probably reach an almost irreducible minimum before long. Dust is a product of unsuitable roads, and its prevention is clearly a task for highway authorities. Cohesive road-binding material has been largely used with excellent results in recent years, and in course of time will be almost universal on main thoroughfares. Even then there must always be a fair proportion of dust on the surface, and the builders and drivers of motor vehicles should be required to avoid unnecessary disturbance of the layer, the former by modifying the form of car bodies and increasing their clearance above the road, and the latter by considerate driving. The element of danger to children using the road as a playground and to flurried or absent-minded adults is one that will become less as the risk is more fully realised. In the meantime drivers must recognise their responsibilities and drive with the utmost care, thinking less of permissible speed limits than of the public welfare.

Fire Prevention in France.

ONE excellent result of the Conference of the French Fire Service Association at Caen was the decision to establish a fire prevention Council after the model of the British Fire Prevention Committee. A special Commission of some thirty members, under the chairmanship of M. Lépine, the chief of the Paris police force, was appointed to consider details of the project, and it is announced that the representatives of various Government departments will be invited to participate in the movement. The organisation and general scope of the British Committee could scarcely be improved upon as a basis for the proposed French Council, but we gather that the intention is to devote even more attention to the popularisation of fire prevention than has been done in this country. The idea is a good one, for however much architects may succeed in reducing the spread of fires by the use of incombustible and non-flammable materials, the public always have it in their power to originate fires by careless or thoughtless habits.

The Doom of Dera Ghazi Khan.

AFTER a protracted conflict with the River Indus, the Indian Government now appear to think that the Punjaub town, Dera Ghazi Khan, is doomed to destruction by the untamable waters of the river. Founded in the XVth century by the chief Ghazi Khan, the town now has nearly 25,000 inhabitants. After disastrous floods in 1878, a masonry embankment was constructed by the Government, but four years later its northern end began to suffer from erosion, and was converted into a groyne. In 1896 additional defences were built, only to be washed away by flood in the succeeding year. In 1901 timber works similar to those employed with success on the Mississippi and Missouri were commenced, but partly washed away before completion. Last year an attempt was made to save the town by cutting a relief channel for flood waters, an endeavour which recent experience has shown to be of no avail. Arrangements have been made for removal of the inhabitants to Choratta, about ten miles from the town, thus giving some justification to the prophecy that Dera Ghazi Khan would some day be re-established near the tomb of its founder at Choratta.

Chancellors and Architects.

AT the Consistory Court at Norwich Mr. Chancellor North has had before him an application by the vicar and churchwardens of Attleborough for a faculty to do certain repairs to the church at a cost amounting to approximately 250*l*., the chief item being 160*l*. for repairing the tower and bell chamber. Mr. William Gaymer, a member of the Restoration Committee, attended and opposed the application on the ground that no properly qualified architect had been employed. At a vestry meeting there were, he said, fifteen in favour of the plans, and eight, with himself, dissented, because the work which would have to be done to the beautiful old Norman tower was of a very delicate nature. That being so, he and his supporters thought the services of a competent architect ought to be secured before the building was touched. Although he was defeated on this point at the vestry meeting, he was convinced that a vast majority of the parishioners agreed with his view, and he handed in a letter from one of the most influential residents (Captain Kennedy) in support of it. The learned Chancellor said he entirely agreed with Mr. Gaymer. He thought a competent architect ought to be employed, and unless that was done he would not grant a faculty. This is in pleasing contrast to the behaviour of some other Chancellors in the past—notably in the far more important case of the restoration of St. Alban's Abbey, when the Chancellor, after admitting that he could not understand any drawing of the proposed work, scoffed at the ideas of those who wanted an architect appointed, and gave the work up to the tender mercies of a building amateur. One may hope that such a course of proceeding would hardly be possible now.

Mr. Seward and the Cardiff Corporation.

FROM a rather vaguely expressed paragraph in the *Glamorgan County Times* we gather that Mr. Edwin Seward has succeeded in preventing the City Council of Cardiff from obtaining legal standing for ignoring the pecuniary obligations of the preceding Council towards him. Many years ago, when Cardiff had not arrived at the dignity of being a City, Mr. Seward's design for a museum and library for Cardiff was selected in an open competition, and he was appointed architect to the then Corporation for carrying out the proposed building. Subsequently, partly on his suggestions, it came about that the Cardiff Museum was to be recognised as a national institution for Wales, and he was instructed to prepare designs for the museum as a national building. It appears that the City Council under the new *régime* not only propose to throw him over as architect, but have declined to consider themselves bound to pay him for the large amount of work he had done. According to the Glamorgan paper, they endeavoured to get a clause inserted in a Bill in Parliament, dealing in part with the national museum, to the effect that existing liabilities and obligations should not be transferred to the new Council. Mr. Seward has succeeded, before a Committee of the House of Commons, in preventing the adoption of this measure; whether he has yet obtained any more solid satisfaction we have not learned. Why the City Corporation should wish to get rid of Mr. Seward as architect we do not understand; it is at the best a very ungenerous action, after all he has done for the cause; and they are not very likely to get a better architect elsewhere.

The Carron Company.

THE Carron Company—iron-masters, iron-founders, coal-masters, ship-owners, etc.—which was founded in 1759, has celebrated its 150th anniversary by a

small illustrated pamphlet of the history of the firm, which is full of interest both in its letterpress and its illustrations. We wonder how many naval historians are aware that the class of guns known as "Carronades," and evidently regarded at the time as a formidable part of a ship's armament, were so called because they were designed and cast by the Carron Company. An illustration of this piece of ordnance is given. The pamphlet contains some notices as to eminent people who visited the works at different times, among others one Robert Burns, who, coming on a Sunday, was refused admission, and revenged himself by a sarcastic stanza scratched on the window of a neighbouring inn. The impressions of a French visitor, M. Faujas de St. Fond, French Royal Commissioner of Mines, who visited the works in 1784, are given at length, and are very interesting and exceedingly complimentary to the activity and energy of the firm at that early date. The first set of complete castings for James Watt's steam-engine was made at the Carron Works, and also the engines for the first steamship built in the United Kingdom, which were built at a cost of 393*l.* 10s. 10d. Before steam-vessels were in use, however, the Carron Company carried passengers in their own sailing sloops, which (according to a poster of March 5, 1779) were fitted out in the most complete manner for defence, and well provided with small arms, and "sail regularly, without waiting for the convoy"; no small recommendation in those fighting times. A company which can show a record of a century and a half, with a larger business than ever at the end of it, has a right to be proud of its history, and their pamphlet has much more than a passing interest. We shall preserve our copy as a historical document; and wish the company another century and a half of success.

THE INFLUENCE ON ARCHITECTURE OF MODERN METHODS OF CONSTRUCTION.

By Horace Cubitt, A.R.I.B.A.*

A retrospect of past ages of architectural evolution, of the ebb and flow of the tide of constructional and artistic achievement, forces the conclusion that in the choice of methods of construction and in the architecture largely dependent on such methods two factors have had predominant influence. It is evident that the materials used have had their effect in determining the form of construction to be adopted and imposing a limit to its possibilities, but of even greater importance in fixing the scope of constructional enterprise has been the human element, the *ego* of all those who have put their hands to structural work.

It must be admitted that without the presence of the faculties of enterprise and inventiveness in the dwellers on the soil the simple existence of materials is of little import. Less recognised, however, is the fact that men may have possessed full power to accomplish building achievements of the greatest magnitude, the suitable materials may have been ready to hand, and yet we find, from purely temperamental reasons, a less enterprising course to have been adopted. We have as an instance the Hellenic Greeks, whose buildings from the constructional standpoint are indicative of an intense conservatism. Yet who shall say that the Greeks, craftsmen of supreme excellence, possessed of a serene and vigorous intellect, master builders as they were in the world of speculative thought, could not, had they so desired, have erected structures of a magnitude rivalling the works of the Gothic builders of nearly twenty centuries later? Both vigour in thought and skill in masonry were present, but as a counterbalancing influence there was the belief that architectural excellence could only be attained by the following of recognised rules which rendered practically impossible the erection of buildings of exceptional height. Again, it is hardly conceivable that the Greeks, with their scientific knowledge, were ignorant of such a simple but most important constructional fact as the principle of the arch; yet we find no arch construction in the buildings of the Hellenic period. The vast edifices of imperial Rome may have been rendered possible of erection largely by the use of concrete, but had it not been for the existence of the virile, inconquerable Roman spirit it is certain that we should have seen no Coliseum, no Caracallan Baths, no massive, many-arched aqueducts linking up the thirsty cities with the far distant hills.

Enough has been said to illustrate the truth of the statement that the spirit of enterprise and the outlook on life current at any given period has had even more influence on the form of construction adopted than the use of any particular materials, important although these may have been in fixing the limits of practical construction. It is to be noted also that in the epochs of great structural development the temperament which brings forth novel methods of construction often at the same time likewise produces a logical and æsthetic treatment of the new forms.

Influence of Construction.

Upon the construction adopted depends very largely the type of architectural design. A disseverance, even in language, of architecture from construction is undesirable without due explanation. It is the thin end of the wedge which has already produced such a cleavage as to have occasioned the engineering design with its "added architecture," of which the Tower Bridge stands as a type, but of which, fortunately, both architects and engineers are becoming rather ashamed. In this attempt to consider the influence on architecture of certain phases of construction the standpoint desired to be taken up is one analogous to that of a person who, for instance, is discussing the influence on plant growth of certain kinds of cellular formation. No one would suppose in such a case that the cellular formation was in itself anything more than one of the bases of plant life, and neither should it be considered that construction can be dealt with as an entity, but simply as an all important branch of the art of building.

There is also the question of the true significance of the word construction. As at the present day applied throughout building work the term is used in rather a restrictive sense as embracing only the carcase work of a structure. Such a narrowing down is not justified when the derivation of the word is considered, and in dealing with the influence of methods of construction the word will be used in its wide significance as indicating the method of drawing together all the multitudinous materials which go to form a modern building.

Changes in Construction.

We are to-day situate at the beginning of an era in which there is but little doubt that the methods of construction are undergoing a change of no small importance. Within the last fifty years scientific knowledge and the numerous industries dependent upon such knowledge have progressed at such a pace as to render a decade of our time equivalent in enterprise to many a preceding century. When men's methods of life and thought are so rapidly changing it can hardly happen that the construction of buildings, linked up as it is with all phases of domestic and commercial life, will be in any respects immutable. Increase in scientific knowledge makes for progress in two ways—first, by creating a form of temperament which accepts with readiness the idea of change, so long as it means real advancement; and, secondly, by enabling the direct influence of science to be brought more and more to bear on architectural work. We see that science has already given us two new building materials, steel and concrete-steel, as regards the use and possibilities of which we are at present merely feeling our way, and who shall venture to prophesy that the next fifty years will not see further new building materials of similar importance brought to our use by modern science? It is perhaps improbable, but is not this the age of the materialisation of improbabilities?

Given as we have an outlook on life vastly different from that of our grandfathers, and materials never before used in the construction of buildings throughout the world's history, it cannot be expected that in the erection of our buildings we shall be allowed to deny ourselves architectural progress. The future with its possibilities and yet just as real attendant dangers is a burning question to architects. For it is unquestionable that if architects fail to adapt themselves to circumstances all but the decorative veneer of building work will come to be carried out by engineers to the disastrous decline of much that is great in architecture.

But that architects are realising the responsibilities of their position is apparent on all sides. Few will be content to sell their birthright as chief builders for the mess of pottage of mere decorative work. But artistic success will hardly be the portion of those who are without faith in the future of modern constructive work. Optimism is justified of her children, and if we of the XXth century are to produce living architecture we must have hope in such forms of design as the exigencies of the age compel us to select and adopt.

The Question of Tradition in Art.

In a discussion of modern developments in architecture we are bound at the outset to face the question of to what extent architectural tradition should be followed: But we have a clearer insight in such matters than was the case twenty years ago. Living scholars have seen the science of history raised from the study of unessentials and lifted out of the mire of war and massacre, of revolt and raid, of priestly plottings and palace intrigues, and placed in its rightful position as the science of research concerning the life and thought of all orders of the community throughout past ages. In these days of rational criticism and analysis the history of architecture, in a somewhat similar manner, is now beginning to be dealt with less superficially. We are now beginning to realise that it is not so much the outward forms of the historic styles which constitute true architecture as the intangible spirit which has inspired such forms—a spirit not to be reincarnated by any slavish copyism, as the works of many of our mediævalists of the last century stand to testify. Renaissance architecture may possibly, however, be thought to illustrate the contrary, but the men to whom we are indebted for the early and most notable examples of stately building in this style received their education in the age of a great literary revival, and drew their first breath and lived their whole lives in an atmosphere permeated by classic tradition. Also we know that the architects of the early Renaissance studied not so much the exact details as the general principles underlying the best of the old Roman work.

So, with the echoes of the hard-fought Battle of the Styles in our ears, we are yet in spirit far remote from those days when

*This is an essay which was submitted by its author for the Institute of Architects' Essay Prize, when it obtained the second place and a prize of ten guineas.

all followers of architecture took upon themselves to believe (most presumptuously, we now think) that art could be satisfactorily manifest only in their own favourite historic style. To remember that even then there were internecine wars, that followers of mediæval ideals were divided among themselves as to whether absolute copyism of old forms was the only road towards perfection, or whether a little individuality might be allowed! We are now far removed from such fanaticism. Year by year augments the ranks of those who have no narrow conception of art and who consider that in the architecture of the future we shall not go far astray if we bring to bear upon the complex building problems presented for solution all knowledge derivable from the work of past centuries, provided only that we do not allow such knowledge to hinder us in satisfactorily supplying the needs of modern life. The "art nouveau" ideal that we should affect wilful blindness towards all that the past can teach us is undisguised anarchism, and is naturally and deservedly discredited.

Whether we shall at length evolve a style voicing in brick, stone, steel, or other more modern materials the spirit of the XXth century is for the future to show. But here again may we not be allowed a little optimism? Surely it is not still considered architectural madness to hope that in time we may succeed in following the lead of every historic age and at length produce a matured style?

It may suffice for the present that we are so far advanced as openly to admit of construction having its great and legitimate influence on architecture. A century or so ago in all buildings of importance the construction had little, if any, influence on the design. Once the appearance of the proposed building had been pronounced satisfactory construction was then called in only for the purpose of putting into substance the draughtsman's conception in any such manner as might be the least unsatisfactory. Let this illustration of the trend of modern thought and practice go to hearten us in our work. We have at least burst the bonds of rigid and unreal formalism, and natural growth is now possible.

The Trend of Modern Construction.

In considering the progressive tendencies which exist in modern construction we enter upon a very wide field. It will hardly be sufficient to deal only with what has actually come into structural form. In fairness to our subject, and in order to obtain a well-considered and broad-minded view, it is necessary to treat not only of the actualities, but also of the fast materialising potentialities of modern construction. Interesting as may be the influence on architecture of our present construction, this is likely to be entirely overshadowed by that of the immediate future, concerning much of which we are already in a position to speculate with a fair degree of certainty.

All who are acquainted with the evolution of Gothic architecture deem of great value, as one of the most noteworthy characteristics of the style, the systematic concentration of loads on comparatively small areas of support. Constructionally this is the very essence of the most highly developed Gothic work. It has been questioned whether the piers were reduced in width for reasons of architectural effect or whether the growth of this pier construction was dependent on practical considerations. Some authorities have argued that the desire to provide large stained-glass windows was responsible for the construction of comparatively small piers. Others have contended that economy of construction determined the size of the piers, and the space between was naturally utilised for the display of painted glass.

Whatever the true reason we have now at the present time a very similar tendency for continuous walling to be superseded by piers united by thin panel walls. With us, of course, the reason is purely utilitarian—a grouping of the material in piers in points where it is wanted to carry loads, and a reduction in the thickness of the walling in places where it has to carry only its own weight; the result possibly being a net reduction in the total amount of the walling. The building regulations throughout the country at present, however, operate in confining this scientific form of construction to buildings erected by bodies such as railway and dock companies which possess statutory powers, and are on this account outside the jurisdiction of local authorities. But we are at the very verge of a striking departure in the character of our building laws. The London County Council propose in the ensuing session of Parliament to promote a Bill to render lawful the erection of steel frame and reinforced concrete buildings—to legalise pier and panel wall construction, in fact—and provincial towns will, no doubt, shortly follow the lead of the metropolis.

Across the Atlantic we find that a pier treatment of architecture is already in existence, and in addition we have a "bean stalk" growth of building which is characteristically American. But the erection of buildings of such enormous height in this country is contrary to the whole current of both architectural and popular opinion. The business classes, who exercise financially a control not to be disregarded, appear to be adverse to any great increase in the height of buildings. Thus, although we may have isolated instances, as now at Liverpool, it does not seem probable that we shall in any way be forced to follow the example of our American *confrères* and vie with them in attempting to attain the clouds.

While in this instance the cold blast of utilitarianism does not appear directed against our cherished notions of the limits to be adhered to in the direction of pleasing buildings, yet this restlessness and desire for progress at all costs, associated, necessarily it may be, with modern commercialism, does in another instance seriously react on our ideals of architecture.

Modern Conditions.

Until recently the building art has had as its pride the practical certainty that a finished work was not merely for the use and interest of a passing generation, but that future centuries would appreciate and carefully maintain any such record of the past. Such a feeling has been doubtless no small consolation to those who have found in the multiplicity of problems connected with the erection of a building of great magnitude a burden almost too great to be upheld. While in buildings of a public character there is not at present any noticeable desire to adopt the use of materials and methods of construction other than those which are calculated to produce a monumental result, in commercial buildings in large towns it is unquestionable that we as a matter of custom no longer build for more than two, three, or perhaps four generations. The standards of sanitation and of suitable arrangement and planning are so rapidly being altered, business methods are becoming to be so revolutionised in the course of a few decades, that from a purely economic standpoint there is no need to erect a building of the most enduring materials if it is to be used for commercial purposes. Probably in eighty or a hundred years, possibly in a much shorter period, its internal arrangements will have become obsolete, the character of the locality in which it is situated will have changed so utterly, the building will have become so unsuited for its requirements and out of keeping with its surroundings that the most reasonable course to adopt will be to demolish and to rebuild. This modern tendency will hardly result in the good of architecture, however satisfactory it may prove to be from the point of view of the architectural practitioner and all connected with the building trade.

But the question must be faced. Architecture has ever to adapt itself to changing conditions. If, in the case of commercial buildings, architects, elsewhere the artists of the ages, have merely to act as glorified scene-shifters, to fix up a suitable stage architecture until the curtain of half a century or so shall have rung down, they must perforce accept such a position and design accordingly. In matters of construction the influence of such changed conditions is already being felt. Materials, such as steel, are being used which in all probability have a distinctly limited life, and also the character of the more ordinary building materials is not such as will enable them to stand the test of time. But the purpose, the erection of semi-temporary buildings, is achieved. No reason exists for deploring the absence of qualities which under the special circumstances are not required. Economy of material is one of the world-recognised axioms of architectural work; and economy in the characteristics of such materials may also in certain cases be similarly desirable.

While the construction is adapting itself to circumstances, should not the same be said of the architecture? If the construction of a building is such that it cannot reasonably be expected to last more than a hundred years, it is hardly consonant with the canons of art that its external appearance should, by mental comparison with that of other buildings, invite the impression that it has been built to stand for four or five centuries. It is surely desirable that our architecture should at least make some attempt to tell its own story.

We have of necessity to accept the fact that commercial buildings are no longer likely to be represented in the historic architecture of the future. In this we must submit to the inevitable. But in our public buildings and all other buildings which do not come under the compelling power of crass commercialism it will be for us to see that in these at least we retain the characteristics of enduring architecture. It may be thought that the plea for the use of none but the best and most monumental walling materials—to wit, stonework, or perhaps brick and stone combined—and also generally for good workmanship and materials throughout, may be based on the assumption that such a course constitutes the truest economy. So great, however, is the effect of compound interest spread over a long period of years that it can be shown by figures to be more economical to erect a cheap building. If the difference in cost between a hundred years' building and one constructed to last at least double this period be placed out at compound interest, at the end of ninety or a hundred years a sum of money will have accumulated sufficient to cover the whole cost of pulling down and rebuilding, and a substantial balance will yet remain. This can be shown to hold good despite the fact that the cost of repairs to the cheaper building will be considerably more than that occasioned where a building is erected in a thoroughly substantial manner and with the very best materials. The argument that good building is the truest economy proves to be thus but a broken reed. Anyone who is sceptical on this point should work out an example with the help of the ordinary interest tables, bearing in mind the fact that the first cost of an economical building will probably be from 70 per cent. to 75 per cent. that of one of a highly substantial character.

Utilitarianism contested solely on its own ground again appears to triumph, but fortunately, however, the decision rests on a higher plane. In the various classes of public and ecclesiastical buildings the elements of strength and solidity, of stubborn resistance to the wearing effect of time, are factors which it is impossible to discount, and which in the eyes of all cultivated persons justly takes absolute precedence of all other considerations. In the higher class of domestic buildings the same applies with equal force, particularly where such

buildings are erected in connexion with property which has been owned by several generations of the same family and is thus of peculiar interest to the present holders. It is fortunate that, even outside architectural circles, there is a strong feeling in favour of the erection of buildings of a monumental character; and in the strength of this spirit depends the future of architecture, in the significance, that is to say, which the term has hitherto held throughout history.

New Materials.

Most intimately connected with modern constructive tendencies are of necessity the new materials which during the past half-century have come into existence, or which now for the first time are being utilised in building work. The use of steel and reinforced concrete has been already incidentally mentioned. Steel as a building material has met with considerable criticism owing to its two undesirable characteristics—the liability of loss of substance due to intermittent oxidation, unless very great precautions are taken, and the unfortunate ease with which unprotected steelwork will collapse utterly under the temperature occasioned by an ordinary fire. As regards the first, it is certain that steelwork as a building material does not possess the enduring characteristics of brick, stone, or even of timber. Buildings which have been so long in existence as to have become of historic interest in most cases have had at some period to undergo either absolute or comparative neglect. Where steel occupies chief place in the construction of the supports and enclosures of a building it is probable that with the greatest care the life of such building cannot be measured in terms of centuries. It is certain that neglect even for a short score of years will result in incipient failure or possibly actual collapse. If it were not for the modern tendency to erect buildings constructed of set purpose to last only for a period of years, steel would hardly have attained its present position as a building material. But buildings of this nature being now largely prevalent a material more suitable for use in such structures hardly exists. For facility of erection and for economy of space occupied by supports steel is at present without a serious rival.

With regard to the behaviour of steel when subjected to fire, if a proper protection of concrete, plaster, terra-cotta, or brickwork be provided there is little risk of failure, and such protection should be considered essential in the case of all stanchions and joists. Statements are sometimes made concerning the artistic effect which may be produced by leaving the metal open to view and burnishing or otherwise decoratively treating the surface. Those who advocate this course doubtless consider that such exposure of constructional members is in accordance with sound artistic principles. But where a heavy load rests on a girder, as in the case of a shop front, steel by itself in such a position is no legitimate constructional material at all. It would be as reasonable in high latitudes to use a bres summer of ice. Such an ice bressummer might do its duty for a good number of years until one summer an extra rise in temperature would occasion its collapse. An unencased steel joist will be quite satisfactory until that not infrequent concomitant of our modern civilisation, a fire, occurs. Then it will be of no more value for carrying a load than the analogous beam of ice.

The exposing of steelwork violates an important principle of modern building science. If it is desired to let the constructional lines be visible, the casing may follow the form of the steel members, and there appears to be no reason why, by means of plaster or other similar fire-resisting treatment, a truthful and satisfactory result should not be thus obtained.

Advocates of reinforced concrete contend that in these two characteristics of durability and resistance to fire in which steel is deficient their combination of materials will withstand criticism. Undoubtedly our existing experience goes to prove the strength of such a contention. Instances are before us of metal embedded in concrete which has been found after very many years to be bright and free from all appreciable signs of rust. It certainly does appear that reinforced concrete, if designed with an ample factor of safety and executed with the best materials and in the soundest manner, is likely to take rank with stone, brick, and plain concrete as one of the most durable building materials. But so very much depends upon the high quality of the materials and the excellence of the workmanship, in addition to the competency of the designer. As regards the resistance of the material under fire, we have some little experience derived from recent conflagrations in the United States, and comparison under such conditions with buildings of the more customary forms of construction has resulted very favourably for reinforced concrete. While the use of the material is at present chiefly restricted to bridges, viaducts, grain silos, and, less occasionally, to buildings of the warehouse type it is probable that in the course of time it will be put to much more general use. If under the test of time its durability comes to receive general acceptance it will probably be used in many large stone-faced buildings to take the place of the present brick backing, although an efficient method of bonding to masonry has yet to be devised. It is possible that a thickness of stone amounting to little more than a veneer, if well secured, might be found to be satisfactory. But a stone treatment very different to that to which we are now accustomed would then be necessary. With but a veneer of stone all heavily-moulded cornices, string-courses, and other architectural features of this nature would be out of keeping with the thinness of the facing material. Probably in buildings of such a proposed character as to render desirable a light decorative treatment opportunity will be taken to use, externally as well as internally, the old Byzantine material, vitrified mosaic, applied direct to the face of the concrete by means of Portland cement. The well-known London example of such a material—the façade of Pagani's Restaurant, Great Portland-street, though erected some ten years ago, shows not a sign of failure in any part. Thus, although the use of glass mosaic is considered by many to be injudicious in our English climate, it would appear that with the best materials and workmanship, and with the use of the more sober shades of colour, a satisfactory and permanent result may be obtained. The selection or discovery of a sound and pleasing facing for reinforced concrete is one whose determination in a satisfactory manner will have a great influence on the future of the material.

Closely connected with these two new main structural materials is the development of the plastic and decorative arts in the form of ordinary terra-cotta and of materials similar in main composition but with an external glaze or skin of any required colour.

With steel frame construction in general use for the less permanent commercial buildings there would be a wide field for such materials as terra-cotta to act as a protection to the steelwork and to form the panel walls between the cased stanchions. Unfortunately, in our existing buildings bad terra-cotta of crude and blatant colour, of vulgar and meretricious design, is largely prevalent. This tends to give the material a bad name, which is in no way justified when the fine and restrained work of several master users of terra-cotta is brought to mind. Whether for external work we shall see in general use very highly-coloured ware of this nature is, however, much open to question. Although variations in colour may be a satisfactory means of obtaining pleasing architectural effect, the use of bright flaring colours in our English climate is entirely another matter. Some persons contend that in this often dull and gloomy atmosphere vivid colouring in our buildings would tend to give a cheerful and pleasant tone to life. Nature in her colour effects aims, however, at a different goal, else should we possess the glories of tropical colour vegetation as a contrast and counterpoise to our more restrained harmonies of sea and sky. The incongruity of such colour blending would, doubtless, be apparent even to those who are advocates of the erection of bright-colour buildings.

In the interiors of our buildings there is much to be said for the use of glazed and enamelled ware of all colourings. From a practical standpoint there are many positions in modern buildings where such cleanly and impervious materials are of great value. Gregariousness rather than the old-time domesticity appears the tendency of the day, and in the increasingly used places of public resort, such as concert-halls, restaurants, hotel lounges, and also in the entrances and staircases of residential flats, there is a great field for the use of such materials. Here, again, as in the case of ordinary terra-cotta, the standard of taste is deplorably low, but glimpses may often be obtained of high decorative possibilities, and, as in the somewhat similar art of colour printing, every year shows improvements in technique. It should be for architects to see that the art of design does not lag behind.

Not a few other though minor materials have recently come into being, some of possibly genuine importance, but no small number are of a purely ephemeral character, and owe their continued existence to the help of the plausible advertisement. But on the two great new structural materials, steel and reinforced concrete, and on the several forms of the plastic arts, it is certain that a great amount of our future architecture will depend.

The Confluence of Art and Science.

It has from all time been the fortune of the art of building to obtain its impulse and life in a manner equalled by no other pursuit from the mingling streams of art and science. Here, as in no other instance, do the salt waters of science derive much vivifying influence from the ever-fresh springs of art. The tendency of the age is clearly towards a still closer connexion between art and science in all that is best in architecture. While art must always remain pre-eminent in all work which appeals to the higher sensibilities, science, present at one time only in the guise of experience, now claims fuller recognition. Without the help of science to determine the stresses to which materials will in any instance be subjected, and the limiting stresses per unit of area which they severally can withstand, architects would be groping in constructional gloom, and the work of dealing with the highest problems of modern building would be in the hands of engineers. The age is gone in which rough rules based on experience were found sufficient. The question of cost occupies to-day such a predominant position that we can rarely allow a factor of safety greater than absolutely necessary; and, even if this were not so, all our construction is fast forsaking the beaten paths where precedent prevails. Were we able to proceed with our constructional problems without the assistance obtained from scientific research it would yet be very illogical that in this case architecture should refuse the proferred help of science, while readily accepting its assistance in many other directions, as, for instance, in the manufacture of the great majority of modern building materials.

The advancement of the position of science in relation to the erection of buildings cannot fail to prove an influence of great moment both particularly in the construction and generally throughout the design. A tendency towards the elimination in the construction of all that is not essential and an exact adjustment of the several parts in accordance with the calculated stresses must make for the purification of architecture. In this we are perhaps likely to find a remedy for

diseases of long standing, for insincerity in construction, for formalism fatal to all true progress, for ostentation often descending to vulgarity. In the coming architecture this closer connexion with science demands its legitimate influence on the design.

In our domestic buildings of the XVIIth and XVIIIth centuries the charm of picturesqueness, apart from such elements as may be due to situation and surroundings, owes its existence to the unstudied manner in which the design and erection of such buildings was effected. The comparative absence of a set and regular scheme either in plan or elevation produces a charm difficult perhaps of analysis, but none the less real. We, however, are compelled to worship at other altars. Attempts with all the modern paraphernalia of working drawings, specification, and quantities, and the rest, carefully to produce the unstudied effect of our historic domestic architecture, must sound the depths of hypocrisy and pretence. It is customary nowadays to sneer at the sham mediævalism of Horace Walpole and his contemporary admirers, but it were well if first we should face the question whether we ourselves have not a touch of the same malady.

Instead of endeavouring to disguise the exact and scientific manner in which modern structures are erected, rather should we accept the limitations of our position, and offer no hindrance to the legitimate influence which our methods of designing and planning and our mode of construction must have on the formation of our buildings. Unstudied picturesqueness is out of the question. There must undoubtedly be a tendency towards regularity of planning and probably towards a still greater use of rectilinear and geometric forms. A building designed purely from an engineering standpoint structurally becomes on plan a regular and ordered series of rectangles. It is a rhythmic conception of joist and stanchion, stanchion and joist, of a design determined by recognised rules applicable to the materials adopted. All this we may say may be very good engineering, but to the artistic temperament it is cold, hard, and lifeless. Here, however, stretches the domain of architecture. Not that the completed engineering design should be "made architecture" by the naive addition of decorative features, but that the engineering conception, the plain construction, in other words, should be altered, moulded, adapted, and withal beautified in any manner which may be appropriate, having regard to the end in view—the production of architecture. While attempting to evolve a logical and artistic treatment of our building problems there is much that we can learn from the two most pure constructional building styles, the Greek and the Gothic. From the Greeks we, who are going back to the old form of lintel and support, should be able to learn much in the way of simplicity and restraint, combined yet with the highest form of art, in dealing with questions arising in the use of these age-tried elements of architecture. As regards the architectural solution of great constructional problems, and more particularly the possibilities of effective pier treatment, we have at hand rich mines of knowledge, lying for the most part unworked and indifferently prospected, in the mighty buildings of mediæval Europe.

Possibly in this greater utilisation of engineering science to meet the needs of architecture ground may be recovered which, from the view of art, has latterly borne but barren fruit. The great Roman builders cared little whether they were called upon to build a temple to the Goddess of Fortune, a group of vast vaulted halls for the purpose of public baths, an aqueduct, a wide-spanning bridge, or an arch to commemorate the triumphal return of some victorious general. All came within the scope of their profession. The craftsmen of the Middle Ages were not only engaged on the masonry of towering cathedrals, abbey minsters, and of the less pretentious village churches and domestic buildings, but also put their hands to the ruder work of castle fortifications and the erection of bridges, many of which latter still remain as examples, we should now say, of Gothic engineering.

Many of the great architects of the Italian Renaissance won fame not only throughout the allied decorative arts, but in the robust science of military engineering. It does not speak well for the fibre of our architects of the XVIIIth and early XIXth centuries that at such a time of great constructional enterprise architects, and with them architecture, should have been so easily dispossessed of all rights of control over the erection of structures of what are now termed engineering type. The result is seen in every town of importance and throughout the extent of all our railway systems. Even if the structures erected by engineers are not, as some most decidedly are, blots upon the landscape, it rarely happens that so satisfactory and monumental a result has been achieved as would have resulted if the designer, in addition to sound engineering knowledge, had also possessed an appreciation of proportion and other like elementary principles of art.

If in the future scientific knowledge may come to be as much in request for the conduct of building work as for that of engineering, no reason will exist for continuing a distinction between these phases of constructive enterprise, and the unwarranted assumption that the quickening power of art is only in one case desirable may be swept away. The possibility that, as an incident in this greater mingling of art and science, art may recover some of her lost possessions should go to relieve the minds of those who find it difficult to adjust their outlook to the force of circumstance, and who view with not a little uneasiness the intrusion of mathematical and experimental science into the realm of architecture.

Recent Architectural Developments.

Critical analysis of the achievements of the hour is ever a temptation of fortune, and all the greater when intangible influences rather than actual facts are under consideration. In this opening decade of a century fraught with astounding possibilities in the field of science it is difficult to say to what extent architecture at this very moment has been influenced by the rapidly changing conditions of life. The architecture of yesterday we can criticise and discuss, on that of to-morrow we can speculate with a considerable degree of interest and appreciation, but as regards the art of to-day we lack perspective and only a tentative treatment is possible.

We do not need to go far back into the recesses of the past to arrive at the time when the influence on architecture of the then recent forms of construction was responsible for nothing more than disquietude and distraction. Men have striven, and with pride, against even the occasional utilisation of materials not possessing the sign manual of centuries' use. Even to-day there are persons who, when contending with constructional difficulties of considerable moment, endeavour to reach a laboured solution by masonry work alone, although the judicious use of iron or steel would be both more economical and efficient. Little objection could be taken to the attitude that these materials demand most careful treatment, particularly when they are used in conjunction with other substances. This would be but sound caution. But the endeavour has been to dispense with any aids of this description, because here is the contaminating touch of modern science, here a thing accursed by engineering associations; and this despite the fact that iron ties were used even in Gothic work and that the most striking figure among English architects thought it no shame to bind the base of the dome of St. Paul's with a girdle of iron, a girdle which recent researches have shown to be practically untouched by the hand of Time. It is small wonder that until such an attitude had been for the most part forsaken the possibilities of modern construction could be of small interest to architects and that architecture pursued its way little affected by changes in construction, these having influence only in the world of engineering.

In more recent days, when architects have gradually come to appreciate many of the possibilities in construction which were first illustrated by engineers, it has yet unfortunately happened that, with a few brilliant exceptions, those who have given chief attention to the solution of modern problems have been influenced by crudely practical rather than by artistic ideals. For the presumed reason that much architecture of the commercial type is often fast bound in the fetters of utilitarianism many most competent men have been content to pursue the beaten paths of building where the construction usually follows the lines laid down by experience. This is to be deplored, and while traversing important thoroughfares in any of our large towns and noticing the modern street architecture, the thought arises that blame for such unsatisfactory work does not wholly rest with owners holding materialistic views nor with uninfluential, down-trodden members of the profession, who, for a livelihood, have had to turn out designs to order, but that some of the discredit attaches also to a school of architects who, with the highest artistic gifts, have, to the loss of architecture, preferred the cloistered seclusion of easy and pleasant domestic work to engaging in the more strenuous architecture of the city highway.

Even among those who have resolutely faced the problems incident to the design and erection of large industrial and commercial buildings there still appears to have been a subconscious striving to resist the natural tendencies of the age. We have as an instance that much-debatable subject, the modern shop front carrying the face of a many-storied building. For the last half-century the shopkeeper has been consistently requiring more and more plate-glass for the purpose of showing his goods to the best advantage. The architect, with the support of the whole of his profession, has been just as consistently fighting tooth and nail against the reduction of the pier areas. But it has been an unequal battle. The power of the purse in such an instance is all-compelling, and this power, directly as owner or indirectly as tenant, is almost invariably in the hands of the shopkeeper. Obviously, if an architect will not provide a client with the window space he requires the latter can go to an engineer or a builder and get what he wants. Thus the architect is faced with the alternative of losing the work entirely or carrying it out in the best manner possible under the circumstances, and he most naturally usually adopts the latter course. A satisfactory architectural treatment is indeed difficult, and when the piers are required to be cased by mirrors, as is sometimes most absurdly stipulated, an attempt to produce architecture is impossible. But in the more usual case, where small piers are not objected to, a fair solution of the problem seems to exist in a light pier treatment of the face of the building above the shop front. From the shopkeeper's point of view there is no objection whatever to the provision of liberal window space in the upper stories, and it is but sound architectural treatment to endeavour, both actually and visibly, to reduce the weight carried by the customary small piers of a shop front.

We should find good cause for criticism if in the early days of Gothic architecture it had been customary to carry out only the lower part of the building in the new style and on the early pointed arcading to superimpose the frowning masses of Norman masonry. Yet this is in effect what we have for years been doing in many of our shop buildings.

The front of Nos. 158-62, Oxford-street, illustrates this new departure in the treatment of a commercial building. Leaving on one side the question of the marble facing material of this building, it is probable that the architect (Mr. Belcher) will, at any rate in the future, be considered to have done much more towards the solution of a pressing architectural problem than if he had followed such an example of reaction—considered solely as shop architecture—as we have in the great rebuilding scheme of the Quadrant, Regent-street.

Among the causes why, till but recently, no special study was given to the legitimate influence of our modern construction was the so-called discovery of a new style, the "art nouveau." Many who, rightly dissatisfied with an epoch of copyism and formalism, might doubtless have done much for the true advancement of architecture have been lured into the fever swamps of forced and irresponsible originality in their search for that *ignis fatuus*, a new, ready to hand style of architecture. Great harm has been done by this exploitation of the spirit of progress for unworthy and futile ends. There has been a not unnatural reaction against any attempts at originality of treatment, and it may be many years before true architectural progress can be dissociated in the minds of many from all that is comprised in the term "new art." Not that there is any connexion between a consistent treatment of architecture in accordance with the methods of construction which are being evolved under modern conditions and the vagaries of the "art nouveau," where construction becomes the bond servant of irresponsible fancy; but some common ground exists in that in both cases there is a departure from established usage.

[The remainder of the essay will be given in our next issue.]

TIMBER BRIDGE OVER THE WEY, GUILDFORD.

THE illustration, from a photograph by Mr. Shawcross, of Guildford, shows the very satisfactory timber foot-bridge, at once solid and picturesque, which has just been built across the Wey, at Guildford.

The design of the bridge is by Messrs. Clemence & Moon, architects, of Guildford, Messrs. Henry Adams & Son, of London, having acted as consulting engineers.

The bridge is of oak from the Weald of Sussex, without any dressing; the clear span is 63 ft. 4 in., and the width 5 ft. It was built in fourteen weeks, at a cost of 394*l.*, raised by public subscription. The bridge was formally opened, by the Mayor, on Wednesday the 25th ult.

The design was selected in a competition, in which sixty or seventy designs were sent in; that by Messrs. Clemence & Moon having been approved by Mrs. G. F. Watts and Mr. Thackeray Turner.

The illustration shows that the bridge is built amid surroundings where it was very desirable to avoid anything that would be out of harmony with their natural picturesqueness; and we may congratulate those concerned on a complete success in this respect; they have erected what is both a good piece of structure and a pleasing object.

NOTES FROM PARIS.

THE attic of the fine façade of the Hotel des Monnaies, built 1771-1775 from the designs of Antoine, has just been decorated with six statues in stone symbolising respectively Law, Prudence, Force, Commerce, Plenty, and Peace. The originals, which were the work of Le Comte, Mouchy, and Pigalle, had been removed on account of their crumbling condition, and the new statues have been modelled on casts taken of the originals.

The monumental staircase in the Louvre, carried out by M. Redon from the original design of Lefuel, is just completed. It is surrounded by colonnades and caryatide figures, and is to have a fine balustrade in wrought iron.

At the Hôtel de Ville the fixing has been commenced of a portion of the decorative paintings commissioned from M. Olivier Merson for the decoration of the two State staircases. These will include the lower part of the right hand staircase, the vaulting over, and the cupolas of the two parallel galleries. Unfortunately, M. Merson's other work, especially that at the Opera Comique, has prevented him so far from completing this portion of the Hôtel de Ville decoration according to the scheme set out by the architect Ballu.

The death is announced, at the age of 58, of M. Georges Dejean, member of the Société Centrale des Architectes, and expert architect to the Civil Tribunal of the Seine.

Correspondence.

THE EFFECT OF PAINTING HOT-WATER RADIATORS.

SIR,—A valuable contribution to the subject of domestic engineering is the paper by Mr. John R. Allen, read at the summer meeting of the American Society of Heating and Ventilating Engineers. It is only intended here to draw attention to a few of the conclusions arrived at after three months' tests in the experimental laboratory of the University of Michigan. Architects desiring detailed information will, I believe, be able to obtain the complete paper from the National Radiator Company, Ltd., by asking them for a copy of the August number of their publication, *Domestic Engineering*.

The interesting fact is that the transmission of heat was almost the same with fourteen coats of paint applied to the radiator as with two coats, and that the effect apparently depended upon the last coat applied, while the intermediate coats through which this heat was transmitted had very little effect upon the heat transmission. That is, the heating effect of the radiator was more affected by the condition of the surface than by the material through which the heat was conducted. The various coats underneath the last coat made very little difference in the heat transmission.

Different vehicles for carrying the pigment give different results; for instance, copper bronze and shellac seem to be better than copper bronze and linseed oil, so that the vehicle appears to have some effect on the value of the heat transmission of paints.

Tests with white lead paints show that the transmission effect with white lead and oil is practically the same as with unpainted radiators, and the same may be said of zinc paints—light green and white.

Finally, the tests appear to show that the poorest coverings are the copper and aluminium bronzes; the best materials tried were the enamels, while white lead paints and zinc paint are only slightly less in transmission effect than a coat of enamel.

G. A. HUMPHREYS, F.R.I.B.A.

COUNCIL SCHOOLS, CRAMLINGTON, NORTHUMBERLAND.—Council schools have been built by the Northumberland County Council Education Committee at Cramlington village, at a cost of over 10,000*l.* The designs for the building of the schools were competitive. The successful competitor was Mr. Karl Spurgin, of Newcastle, and the schools are designed to accommodate nearly 700 children. Built of ordinary pressed bricks, with stone facings, the building is of two stories. The contractors were Messrs. Bertram & Bolam, of Birtley.

Foot-bridge over the Wey, Guildford. Messrs. Clemence & Moon, Architects.

THE BUILDER

SEPTEMBER 4, 1909.

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MEETINGS.

SATURDAY, SEPTEMBER 4.

Manchester Society of Architects (Incorporated).—Visit to Liverpool. The following buildings to be inspected:—The New Cathedral, Mr. G. Gilbert Scott, architect; Dock Board Offices, Messrs. Briggs & Wolstenholme, Hobbs & Thornely, architects; the Hall and Reception Rooms at the Town Hall (1754), Wood, of Bath, architect.

TUESDAY, SEPTEMBER 7.

Manchester Society of Architects (Incorporated).—Visit to the Y.M.C.A. Buildings, Peter-street, now in course of erection (Messrs. Woodhouse, Corbett, & Dean, architects).

FRIDAY, SEPTEMBER 10.

Manchester Society of Architects (Incorporated).—Visit to the Garden Village, Burnage.

ORDNANCE SURVEY.

FROM an official report on the progress of the Ordnance Survey up to March 31, 1909, it appears that the revision of the large-scale maps (1-2500 or 25 in. to a mile, and 1-10560 or 6 in. to a mile) is being carried out, with the sanction of the Treasury, at a rate to ensure that no part of Great Britain will have been unrevised for more than twenty years, and there is now no area which has not been brought within this category. With the exception of the coloured edition of the 1-in. map of Scotland and of the 2-mile maps of Scotland and Ireland all the small-scale maps (viz., 1 in. to the mile, 2 miles to the inch, 4 miles to the inch, 10 miles to the inch, and 16 miles to the inch) are now complete, and are issued to the public in the various forms described in the catalogues of publications. New editions of these maps are issued from time to time as the normal revision of the 1-in. map in the field progresses. The survey and publication of the 1-2500 maps were completed on March 31, 1890, with the exception of Lancashire and Yorkshire, which were similarly completed and published in 1895, having been originally published on the 6-in. scale. The field work of the first general revision of the original 1-2500 plans, which was commenced in 1894, has been completed, and the revised plans have now been published. The field work of the second general revision is now in progress in Yorkshire, Lancashire, Cheshire, Flint, Hamshire, and Sussex, and publication follows as rapidly as possible after the completion of the manuscript plans. The revised 6-in. maps of England and Wales are, as a rule, being reduced from the revised maps on the 1-2500 scale, and published by heliozincography in quarter-sheets. In uncultivated districts the revision is made direct on the original 6-in. maps. Publication follows as soon as possible that of the 25-in. plans. The publication of the 6-in. maps of the first general revision is now complete, and 1,477 sq. miles of the second general revision have been published during the year. Maps of the whole country on the scale of 1 in. to a mile are published in various forms. Last year 4,412 sq. miles were revised, 6,658 sq. miles drawn, and 6,096 sq. miles engraved. As revision progresses the coloured map is now being issued in larger sheets, seventy-one of which have been published. Combined 1-in. maps in outline have been issued for various districts and centres. The map on the scale of 2 miles to an inch is based on the 1-in. map. It is now available in the larger sheets for the whole of England and Wales. As reprints of the sheets are required any recent revision available on the 1-in. map are embodied. The edition of this map on the larger system has now been completed and published in the larger sheets. The plans have been published of all towns entitled to a large-scale survey at the date of the survey of the district in which they are situated. Surveys have been extended and revisions made at the expense of the local authorities in the case of the following towns:—Aberystwith, Cambridge, Cardiff, Carlisle, Coventry, Doncaster, Exning, Grimsby, Hartlepool, Newcastle-on-Tyne, Rochdale, Sheffield. Similar work at Leeds is at present in progress. The extension of the 5-ft. scale survey of London, which was undertaken for the purposes of land registry, is completed.

Fifty Years Ago.

FROM THE *Builder* OF SEPTEMBER 3, 1859.

A PROPOSAL AS TO BLACKFRIARS BRIDGE.

THE recent fall of the bridge at Walton-on-Thames (happily unattended with loss of life) leads us to think of what may happen one day to Blackfriars Bridge, and to notice a scheme by Mr. H. G. Coombs, of Union-street, Borough, for preventing such an occurrence there, which is now claiming the attention of the Bridge Committee.

There can be no question that the matter demands very serious attention, for the condition of the bridge is deplorable in the extreme; and looking on the face of matters, it certainly seems strange that it should be allowed to remain in its present state.

Mr. Coombs's plan consists in removing the three central arches of the bridge, and substituting a cast-iron elliptical arch of 285 ft. span, with a radius of curvature at the crown of 500 ft. The arch is composed of eight ribs, six of which are of cast-iron, and the two external ones are of wrought, to provide against risk of fracture by collision; the carriage-way is supported on cast-iron corrugated plates, and the footways are on a lighter construction.

The idea is a bold one, and deserves consideration. At any rate, it is quite time that some stir was made in the matter; and we shall thank Mr. Coombs or any other gentleman who may be instrumental in leading to a remedy of what is admitted to be a serious evil.

*** It seems a pity that this idea was not carried out. We should then have had some portion of the fine XVIIIth-century masonry bridge preserved as a record; and in an architectural sense the effect would at any rate have been better than that of the tawdrily-designed bridge which was substituted, and unfortunately still exists to annoy the eye of every architect.—ED.

SELBY ABBEY.—The reopening of Selby Abbey is announced to take place on October 19, the third anniversary of the fire. The Archbishop of York will perform the dedication service and preach the thanksgiving sermon. A faculty has been granted in the York Consistory Court empowering the Rev. Maurice Parkin, the vicar, and the churchwardens of the parish church of Selby, and Lord Wenlock, Chairman of the Executive Committee appointed to carry out the restoration, to fit up a side chapel at the east end of the north aisle, and to erect an oak screen on the south side to divide it from the easternmost part of the church, etc.

Illustrations.

ADDITIONS TO TOWN HALL, STOKE-UPON-TRENT.

WE give the perspective view and plans of the design by Messrs. Garratt & Simister, for additions to the Town Hall, Stoke-upon-Trent, which has been placed first by the Assessor. The following extracts from the architects' description of their design will serve to explain it:—

"Owing to the uncertain nature of the ground, in preference to excavation for probably an unlimited depth the authors would propose laying over the site a ferro-concrete raft, after same had been rolled with heavy steam rollers, from which the building would be begun. The authors suggest in any case that the Committee should adopt this suggestion with a site such as this; the cost would be much cheaper than carrying the walling down or piling, and would be quite safe and substantial.

The Town Hall has been arranged on the northern portion of the site with entrances from Tower-street, and also from the main entrance of the existing building, and has been so planned that if desirable it could be shut off from any special local functions. The small Assembly Hall has been planned with its entrance from Acqueduct-street. The authors feel that this will undoubtedly be the room in which the Council will carry on the work of the Borough, and it has been arranged with this in view.

The Court has been arranged in Tower-street with separate entrances for prisoners, public, and the magistrates, etc., and the large committee-room has been planned in close communication with the main Court and judges' rooms, so that it could be used for the second Court on any occasion. Rooms have been provided in the Court block for judge, solicitors, jury, and witnesses.

All the accommodation asked for has been practically planned, and the ground floor with the exception of the banqueting-room, and the idea of planning any room in the basement suggests itself to be unpracticable and inconvenient in this case. The four spare rooms asked for have been so arranged that they can be readily used by the Court or the small Assembly Hall when required. The caretaker's rooms have been arranged in a central position over the main staircase and kitchen, and having communication on each floor. No alteration is suggested to the existing building other than minor alterations where the new building is connected.

It is proposed to face the building with white Hollington selected stone, backed with good, hard, well-burnt bricks. Roofs would be covered with Welsh green slates. The whole of the floors, staircases, and roofs would be of fireproof construction, and all flat roofs would be finished with mineral asphalt. The joinery in the Court and small Assembly Hall, and wherever else possible, etc., would be of wainscot and other hard woods, and the ceiling in modelled fibrous plaster. Marble would be used in the finishing of the entrance hall and main staircase.

The whole of the offices, etc., would be heated by means of ventilating radiators fixed under the windows; the corridor and entrances by direct heating radiators. The Assembly Hall, Court, and large committee-room, and small Assembly Hall will be warmed and ventilated on the Plenum system, the apparatus being fixed in the roof in a convenient position.

The Assembly Halls and Courts would be arranged on a separate circuit to enable them to shut off independently when not required. The heating surface will be arranged on the vacuum system, which will allow the temperature to be kept low and all connexions small, thus preventing any danger of frost.

The hot-water service would be worked from a central point in conjunction with the heating system in the winter-time, and a

small independent boiler would be provided for use in the summer months."

We give also the perspective view and plans of the design by Mr. Haywood, of Birmingham, placed third by the assessor.

We have not received any description of the design from the architect, and must therefore leave the perspective view and plans to speak for themselves. The design makes a good piece of architectural composition in a severe classic style.

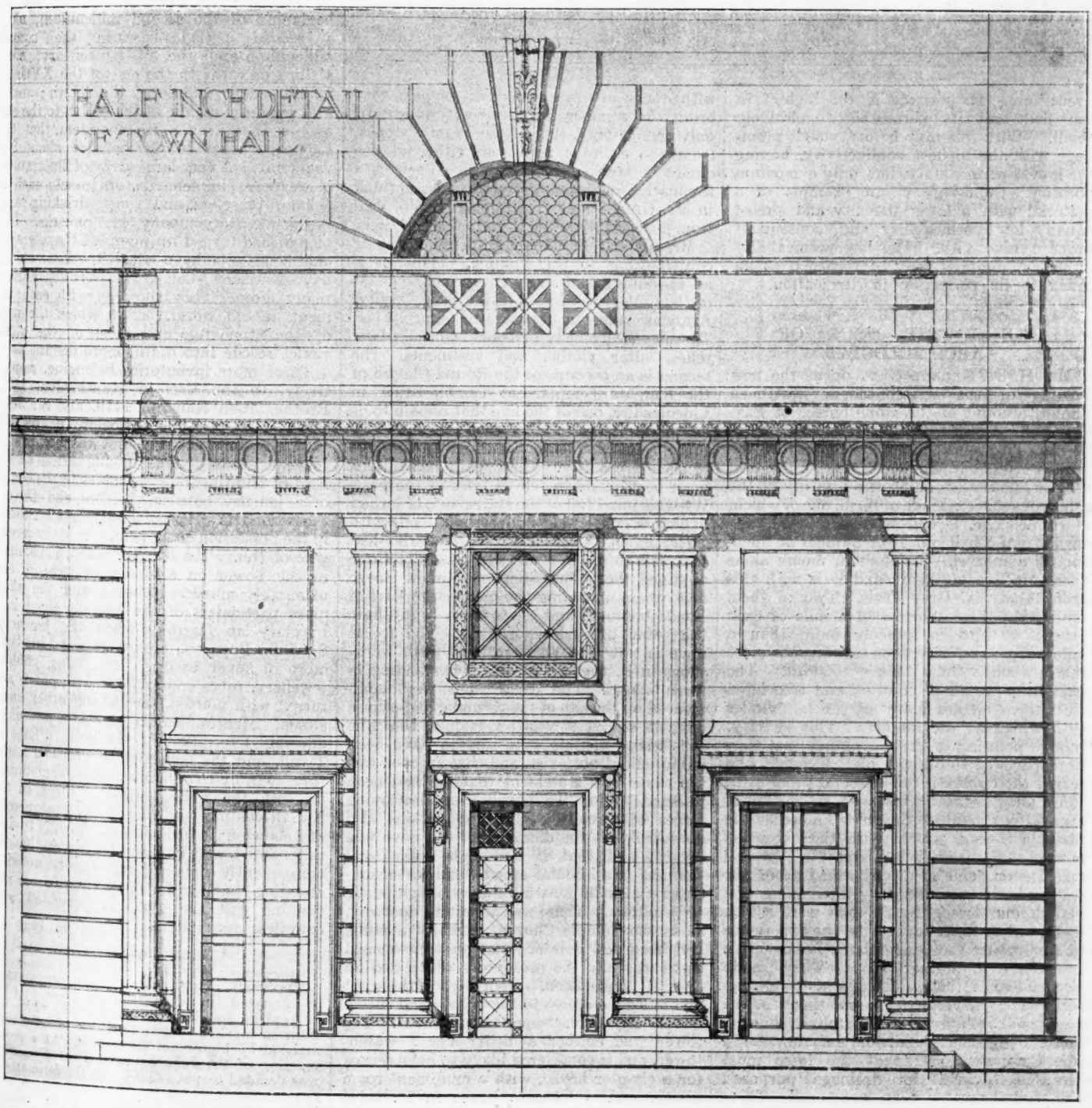
THE CONDUCTIVITY, POROSITY, AND PERMEABILITY OF REFRACTORY AND BUILDING BRICKS, ETC.

THE behaviour of fire-bricks towards heat is determined mainly by chemical composition, but also by the state of aggregation of the mass, regarded physically. Similarly, resistance of stoneware, terra-cotta, or ordinary bricks, to climatic influences is influenced by the state of vitrification, which may be regarded as the reciprocal of permeability. The researches of S. Wologdine into the above-named properties have been extensive, and he has determined their magnitude in a large number of specimens, and in some cases after different degrees of burning in the kiln of the maker. Simonis has shown that the heat conductivity of refractory materials depends on the quantity of contained air—that is, on the porosity—but the value of Wologdine's measurements consists in the importance which they show must be attached to the permeability to gases. The latter fact is obviously of great significance, because it is no advantage to a body as a non-conductor to have high porosity if gases can freely circulate therein. On the other hand, if a material is desired to have high conductivity, then high permeability—which, after all, is incompatible with very low porosity—is an advantageous factor.

Wologdine's conclusions are, then, to the effect that the heat conductivity of material depends not only on the porosity, but also on the degree of isolation of this contained air or its mobility; in other words, on the permeability of the substance to such gases as will come in contact with it. In general the higher the temperature of burning the smaller is the porosity and the higher the conductivity; but in some cases, as with silica bricks, the percentage porosity remains nearly constant whatever the temperature of the kiln in which burnt, although the permeability shows a noteworthy difference. In the experiments recorded in the subjoined table it is seen that whilst with rise of temperature from 1050 degrees to 1300 degrees silica changed in permeability per square metre in litres per hour through a thickness of 1 metre from 3·32 to 192·0, magnesia changed from 186·1 to 3·49.

The co-efficient of conductivity stated in small calories is the quantity of heat transmitted through a thickness of 1 centimetre across an area of 1 sq. centimetre in one second for a difference in temperature of 1° Centigrade.

The porosity was calculated as usual, from the real and apparent specific gravities, and expressed as a percentage of total volume. The permeability was determined by measuring the quantity of air forced under constant pressure, namely, that equal to a small height of water through a short cylinder of the material tightly enclosed in a glass tube, passage of air between cylinder and tube being prevented by a film of paraffin wax. It was found that the permeability varied in different directions along the same



Design for Additions to Town Hall, Stoke-upon-Trent. By Messrs. Garratt & Simister. Detail Elevation.

NOTE.—The words "half-inch detail" on the illustration refer, of course, to the scale of the original drawing, not to this reduced reproduction.

piece of material. The results are stated as cubic centimetres passing through a thickness of 1 centimetre across an area of 1 sq. centimetre in one second, under a pressure equal to water column of 1 centimetre.

This abridged table shows the lowest conductivity in kieselguhr, used in this country sometimes for filtration purposes, and at others with a binding medium under the name of "fossil meal" as a non-conductor for covering steam pipes, boilers, ovens, etc. Its porosity is the highest in the list, and its permeability relatively small. With this may be contrasted plumbago with the highest conductivity, having the lowest permeability, but only a medium porosity. Stoneware is an example of a material with a lower porosity and almost equally low permeability and consequent lower conductivity. The low permeability of such a material may be regarded as an index to its perfection in vitrification.

Material Tested.	Conductivity in Small Calories.	Specific Gravity of Specimen.		Porosity. Per cent.	Permeability in Cubic Centimetres.	Temperature of Burning. Degrees Centigrade.
		Real.	Apparent.			
Fireclay { From	0·0030	2·61	1·81	30·8	0·015	1050
Fireclay { To	0·0050	2·50	1·90	24·1	0·105	1300
Brickclay	0·0039	2·65	1·91	27·8	0·0465	—
Bauxite I.	0·0031	3·22	1·89	41·5	0·0292	1050
do. II.	0·0033	3·12	1·92	38·4	0·212	1300
Silica I.	0·0020	2·75	1·58	42·6	0·0092	1050
do. II.	0·0 31	2·62	1·50	42·9	0·5360	1300
Magnesia I.	0·0058	3·07	2·00	35·1	0·517	1050
do. II.	0·0065	3·39	2·00	41·0	0·0097	1300
Stoneware I.	0·0032	2·56	1·96	23·4	0·0022	1050
do. II.	0·0048	2·42	2 18	9·59	—	1300
Porcelain, "New"	0·0046	—	—	—	nil	1400
Building Brick	0 0037	2 56	1·90	25 7	0·0015	1050
Terra-cotta Brick	0·0033	—	—	—	—	1050
Another Mixture	0·0028	2·54	1·95	23·0	0·0021	1050
Light Clay	0·0024	2·60	1·41	45·2	0·0164	—
Kieselguhr (or infusorial earth)	0 0018	2 48	1·03	58 0	0·0957	—
Plumbago	0 0185	2 27	1·7	28·4	0·0012	1300

THE LATEST ISSUE OF "ARCHÆOLOGIA."

MR. H. ST. GEORGE GRAY opens the new volume of the "Archæologia" with a minute account of the stone circles of East Cornwall. The purpose of these great circles of unhewn stones in different parts of the United Kingdom remains as much a mystery as ever, notwithstanding the scrutiny of the numerous surveys made of them, one of which, at Stonehenge, it will be remembered, was made from a balloon. The number of them, too, is a marvel. On Bodmin moors alone there are five of them; and it is with this group that Mr. Gray deals. Two of them are within three-quarters of a mile of each other; a third is scarcely more than a mile away; and the other two are not more than about three miles distant. The monoliths are all of granite; and associated with them all are many of the hut circles with which we are familiar. This vicinity, though pointing to the probability that they were parts of the homes of the people who reared the circles, is not absolute proof of it.

Mr. Gray begins his task with an account of excavations made at the circle known as the Stripple Stones, which, with the exception of that at Fernacre, is the largest in Cornwall and Devon, and is distinguished from the rest by being surrounded by the remains of a vallum and fosse. Seven men were set to work, one of them having had the experience of conducting the Glastonbury Lake village researches in former years. They made twenty-five cuttings, some of which were ten feet wide. Several facts relating to the fosse and vallum were ascertained, but no traces of burials found, and but few finds. Mr. Gray concludes that the fosse must have been meant for drainage purposes, the soil being a very wet one. There were originally twenty-eight stones in this ring, of which but four are left standing, the rest that remain being prostrate. They were placed at a distance of 16½ ft. apart, round a somewhat flattened circle measuring about 280 ft. by 255 ft. The nearest ring, at Trippet, has eight stones standing and four prostrate out of a former twenty-six; that a mile and a half away, at Lease, has ten standing and six prostrate out of its orignal twenty-two, and they are 12 ft. apart; the Fernacre example, three miles to the south of the Strippet stones, has seventy-one stones, of which thirty-nine are standing; and there are forty-one standing at Stannon, with others prostrate or deep in the peat, that bring the number up to seventy-nine. In only one instance, that of the Trippet stones, from the Stripple ring, can either of the circles be seen from the others. There is a fascination in this subject that loses nothing in Mr. Gray's hands, and gains a great deal from his careful and picturesque illustrations.

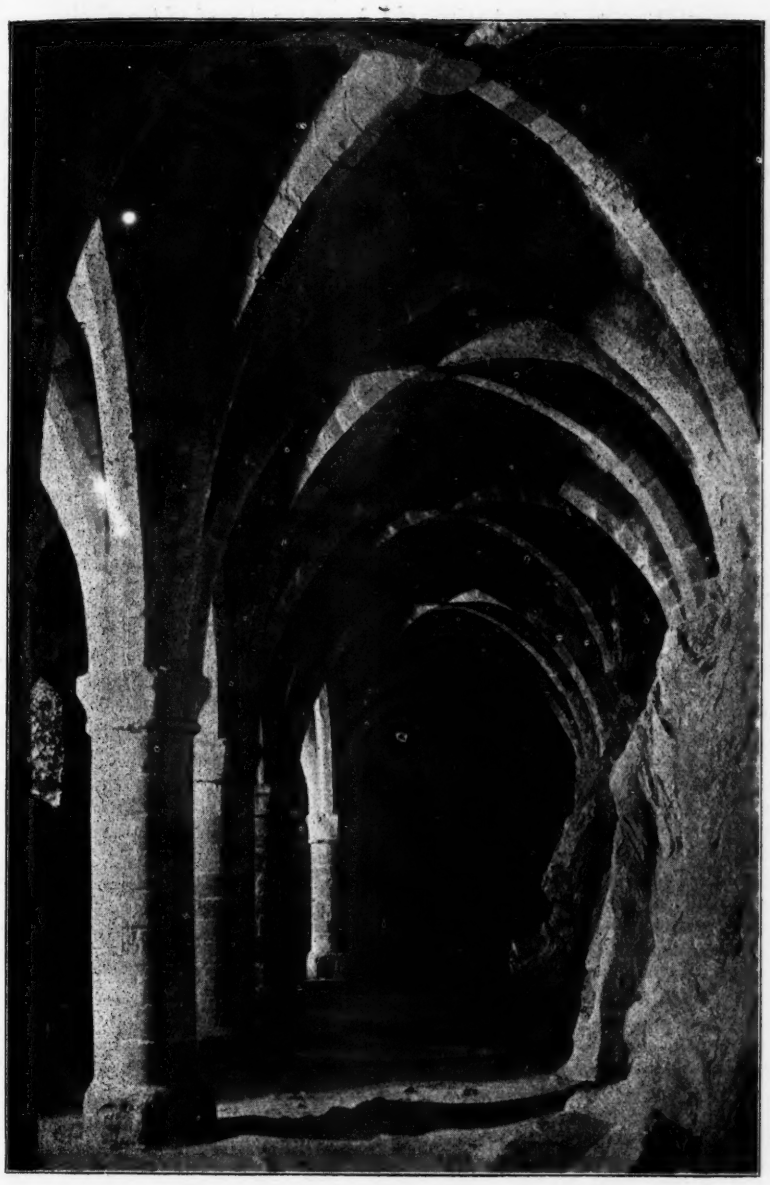
Mr. W. H. St. John Hope makes four contributions to this volume. The first is an examination of an inventory of the goods of the Collegiate Church of the Holy Trinity, Arundel, taken in the days of Henry VIII. These consist chiefly of books, church plate, relics, altar cloths, and vestments. The second is an account of the Round Church of the Knights Templars at Temple Bruer, in Lincolnshire, one of the five that remain to us out of the large number that the numerous preceptories doubtless possessed in the days of their prosperity. Here again excavations have been made to tell us tales of the past. With his mind full of the statements of former explorers concerning underground cells with skeletons in them, as of captives who had been left to die in them, Mr. St. John Hope obtained the co-operation of Captain Rceve and others, including the owner, the Earl of Londesborough, and set to work to lay bare the scene of such enormities. The round nave is now but an open yard with workshops in it, though the tower is standing in three stages. The excavations were commenced on the site of the rotunda, and after a diligent search it was ascertained that the cells where victims were said to have been immured did not exist, and that an oven was the cause of a statement that fire had been resorted to for the purpose of destroying traces of atrocities. The excavations also disclosed that the diameter of the nave was 26 ft., and that it had eight cylindrical columns in a circular arcade, and an encompassing aisle 9½ ft. wide that was lighted by six windows. There was a western doorway, as in the Temple Church, to which a porch had been added later; and an arch opened eastwards into the presbytery which had an apsidal termination. Doorways to the right and left gave access to the crypt; and subsequent alterations were also traced. The tower was neither a belfry nor a watch-tower, and is considered likely to have served for a chapter house, with a muniment room above, and a treasure house in its third story.

The next contribution made to the general stock of information by this diligent antiquary relates to the most recent investigations on the site of the Roman city at Silchester, Hants, that have now been carried on for upwards of eighteen years. His fourth concerns the Castle of Ludlow. All are lavishly illustrated with the exception of the inventory. The Chapel of St. Mary Magdalen, in the inner bailey of Ludlow Castle, has a circular nave with a wall arcade of seven arches on either side of the western doorway, the arches being alternately moulded and enriched with chevrons; and a chancel so far conforms to the round church examples as to have a semi-octagonal apse. Excavations gave the information that this last was formerly 12 ft. square; the apse 11 ft. wide; and the total length of the chapel 54½ ft. The fact that there is no mention of this fine border fortress in Domesday Book is met by the belief that the site of it is in the manor of Stanton, which is duly mentioned in that record, and that when built, immediately after the Norman survey was made, the town gradually grew up round it.

Dr. Oscar Montelius takes up the tale of old times with a study of the chronology of the Bronze Age in Great Britain and Ireland. His wide Continental experience brought to bear upon the subject has inclined him to divide it into five periods—the Copper Age, when the alloy with tin was unknown or very rare, dating from the middle of the third or beginning of the second millennium, B.C.; a second period between the second millennium and the XVIIth century, B.C.; a third onwards to the end of the XVth; a fourth to the middle of the XIIth; and a fifth from the middle of the XIIth to the end of the IXth, B.C. He considers that the Iron Age began in this country about 800 years B.C. A very large array of illustrations of weapons, implements, ornaments such as collars, bracelets and rings, drinking-cups, tools, etc., accompany his remarks. The plough has turned up many of these, gravel and sand pits have yielded others, cairns have concealed some, graves have kept hidden many more. They show as with enchantment an old world, before which the men of the Stone Age and those of the stone circles recede into a still more distant past.

Three more inventories belonging, respectively, to the Earl of Huntingdon, 1377, Brother John Randolf, 1419, and Sir John Boys, 1426, are placed before us by Mr. W. Paley Baildon. The first was made out in consequence of a robber having carried off the Earl of Huntingdon's valuables in the course of a journey between London and Dover; the second is a list of costly articles found in the possession of the confessor of the second wife of Henry the Fourth, who was confined in the Tower on a charge of treason, and ultimately murdered there; and the third gives particulars of the loss sustained in a burglary at Harrow, when the house of Sir John Boys was broken into, and his large store of silver basins, ewers, cups, goblets, jewellery, robes embroidered with pearls and furred with marten, sheets, and other linen, stolen. Mention should be made, too, of an alluring description of the Villa d'Este at Tivoli, and the collection of classical sculptures in it, by Dr. Thomas Ashby, acquainting us with the riches gathered there in the XVIth century and dispersed subsequently, and showing us, incidentally, the villa to-day, untenanted, with its beautiful gardens looking consequently somewhat melancholy, notwithstanding that the famous fountains are still running and the scene is pervaded with countless associations.

PROPOSED TOWN HALL, JOHANNESBURG.—It is stated in the Australian Press that the revival in the Rand building trade which has been so marked of late is likely to be greatly assisted by municipal enterprise. At a recent meeting of the Johannesburg Town Council it was decided to put 125,000*l.* on the estimates of capital expenditure for the construction of a Town Hall. The building is to include galleries and seating accommodation for 2,000 persons, organ loft, orchestra, and platform, supper-room, Council-chamber, and committee-rooms.



Crypt, Chillon Castle. From a photograph by Mr. H. Stuart Thompson.

CRYPT, CHILLON CASTLE.

WE do not believe an illustration has been published before of this bit of vaulting in the crypt of the Castle of Chillon, a building more celebrated in poetry than in architecture.

It is from a photograph sent to us by Mr. H. Stuart Thompson.

CONCRETE: ITS AGGREGATES AND MIXING.*

IN this paper the author claims that concrete, the physical properties and form of its aggregates, the methods of proportioning and mixing, may be advantageously considered, from the point of view of their practical application, as apart from that of the purely scientific standpoint of the laboratory.

It is not intended to in any way ignore the importance of the work done in the laboratory. The author ventures, however, to submit that such work can only be taken as an approximate guide for the actual completed work. The conditions which obtain in the laboratory in respect to variation of temperature, incidents of position and materials, can never be so varied as those which occur in actual practice.

It may be advanced against this statement that the variation shown in strength of a number of test pieces made in the laboratory approximates to variations which may occur in actual practice, but the author suggests that the very extraordinary figures which are often added together to obtain an average, are evidence only of some mechanical or other inconsistency in the preparation of the test pieces. For these reasons it is proposed to deal with conditions inseparable from the actual work rather than the more academic side as demonstrated by the expert and chemist in the laboratory.

It is also the author's wish to limit this paper to a consideration of the coarser component parts of concrete, and its mixing, without entering upon the wide field of how the binding materials are made, their quality and possible admixtures, or as to whether the modern idea of reinforcement is advantageous or otherwise, except in so far as to claim in regard to reinforced as well as plain concrete that there can be no doubt that the advantage in either case will be to the best proportion and most perfectly distributed mixture in whatever strength may be dictated by necessity or economy.

It is therefore assumed that the binding materials used are the best of their respective kinds, and that, in the case of Portland cement, the initial set is such in regard to manner and time as the exigencies of the work require, and that they will proceed to the condition of permanency in hardening, providing that there are no elements in the aggregates to injuriously affect the attainment of such ultimate condition.

As its name implies, concrete, when in a finished condition, should be a perfectly homogeneous and fixed mass, and whatever the proportions, its constituent aggregates should be equally distributed throughout the whole. It is, however, obvious that this condition cannot be obtained if the constituents do not each in their own way lend themselves to secure this result. This may be considered a very elementary condition, and the necessity for its repetition doubtful, but it is one of those elementary principles which, though always endorsed by intention, frequently fail in actual practice.

Although the binding materials are essentially the principal ingredients, they are, nevertheless, largely dependent for their value upon an intimate association with other materials, as also upon the composition and form of these, and the chemical action of the binding materials may be assisted or retarded by these other ingredients, which invariably form the greatest proportion of the finished mass. In this connexion it is by no means unusual to find engineers, who, without further investigation, attribute any failure or degeneracy in concrete to the cement, when probably the cause is entirely due to injurious elements which are contained in the aggregates.

Sand.

In a paper read recently before the members of an institute which has been lately formed ostensibly for the purpose of enlarging and connecting the knowledge associated with this important department of engineering, it was pointed out that there was no objection to foreign matter in the form of finely divided clay occurring in the sand intended for use in making concrete, but the author of the paper made reservations as to this, by advising that tests be carried out before risking its use.

The author submits that though supported by exhaustive laboratory tests it would be unsafe to give any contractors latitude in so important a matter.

Clay has frequently been used, to secure the requisite density in the finished concrete, when, owing to local circumstances, suitable sand could not be easily (or more probably cheaply) obtained, but the author ventures to state that there are other safer and much more certain methods of securing this condition, and with which greater ultimate permanency could be assured without the risk that must always be associated with the use of clay.

As the permanency of binding materials —especially Portland cement—is affected by the composition of the sand, this material merits very careful selection, and it will frequently be found that a little extra cost incurred in providing suitable sand will not only advantageously affect the stability of the work, but be repaid by a saving in quantity of cement.

In this connexion it was interesting to note the result of some experiments carried out by Mr. Spackman (the joint author of "Calcareous Cements" (Redgrave and Spackman), and the author, which showed that a very good sample of cement when mixed with three parts of sand showed a slight degeneration after six months, whereas the same cement with five parts of sand gave an increasing strength up to the end of the year's tests, and beyond them.

The description of sand as clean and sharp, commonly adopted in specifications in this country, although apparently sufficiently absolute is frequently taken in a relative degree, therefore the more elaborate description secured in the specifications of German and Belgian Government engineers might secure the material better than our rather widely accepted description.

The following quotation embodies the salient points of several specifications of very large works designed by Continental engineers:—

"The sand shall be of quartz or other suitable formation, but shall not be of foliated structure, nor contain more than 2 per cent. of foreign matter," and after limiting the fineness or coarseness of the grains to suit conditions of location and nature of intended works, the specification proceeds to enact—that it shall be graded so that it shall not contain a greater proportion of voids than 40 per cent.

If the foreign matter is in excess of the

* A paper by Mr. W. Challoner read at a metropolitan district meeting of the Incorporated Association of Municipal and County Engineers, held at Westminster, March 26, 1909.

limit provided, the contractor understands that the sand will have to be washed, and if the limits of coarseness or fineness are exceeded it will require to be sifted, and further, that if the forms and sizes of the particles cause a greater proportion of voids than is allowed by the specification, he will have to obtain other suitable grades to mix with the bulk in order to reduce the voids to their proper proportion.

From compliance with the first two conditions no amount of argument will secure to the contractor any concession, but in the last he may in some cases have the option of using a sand containing a slightly greater percentage of voids—providing he uses a relatively greater proportion of cement or other specified binding medium to fill them; with the result that he usually elects to grade the sand.

Similarly, if the contractor provides a suitable sand containing a less percentage of voids than 40 per cent. he may in some cases be permitted to reduce the proportions of the binding materials.

Broken Stone or Gravel.

In like manner the specification of stone for making concrete, after limiting the size of the smallest and largest particles, which may vary in respect to the particular necessities of the work, describes that it shall be hard and not capable of absorbing more than 6 per cent. of moisture, nor shall it disintegrate at a temperature between 1° and 200° Centigrade. It shall be thoroughly washed free from dust, earth or other foreign matter, and the period of this operation is limited to some suitable specified period before it is mixed in the concrete.

To these restrictions are usually added others to secure the exclusion of stone or ballast which contains traces of sulphur or oxides of iron, or to prohibit the use of burnt chemical refuse, slag, or carbon materials which may contain these elements.

(In the case of dredged ballast, some of the prohibitions are unnecessary, and for purposes where great strength is not required others of the restrictions may be slightly modified.)

As in the case of the specification for sand, the particles of stone must be graded to contain a percentage of voids not exceeding 40 per cent., but if the voids are reduced below that percentage the contractor in some cases may effect a saving in the amount of mortar (binding materials and sand) to be added to the coarser and usually cheaper aggregates—the reasons for this will be shown later when treating upon the proportions of ingredients in the bulk of finished concrete.

Water.

Although not of the same frequent necessity as stipulations regarding the other component parts of concrete, it is advisable to provide in the specification that the water shall not contain impurities that will injuriously affect the hardening or ultimate permanency of the concrete.

Of these impurities, peat, vegetable matter, and salt are perhaps the most common objections, although where hydraulic silicates are used (as is the common practice on the Continent) sea water gives the very highest results in regard to strength and permanency.

Most exhaustive tests made by Messrs. Sanger & Blount some years ago in this country also how that when trass, a puzzolana of standard quality, is used with cement and sand gauged and immersed in sea water, the strength is increased considerably in comparison with the same mixture, of cement and sand alone, when gauged and immersed in fresh water.

Although perhaps a little outside the object of this paper, there is room for consideration of the undoubted advantages of permanency and density which may be secured by the use of hydraulic silicates as an admixture in the composition of mortars and concrete, but until engineers are prepared to pay greater attention to the selection of aggregates and proportioning of the volumes, the full advantages obtainable by the use of puzzolana, trass, and other similar materials cannot be secured.

Also the undoubted advantages of lime (with these materials as a mixture to impart to it cementitious attributes) for many engineering works where impermeability and lower cost is more necessary than great strength developed in a short period of time.

Measuring and Proportioning of Volumes for Concrete.

There would appear to exist amongst engineers and contractors a somewhat lax conception of what constitutes the correct volumic proportions of concrete, and that evidently arises from the questionable practices which are common in this country of measuring the aggregates (sand and stone) in combination, and computing the volumes from the dry unmade materials instead of the finished concrete.

It is unnecessary to state that the data of strengths which are given by engineering text-books are obtained from the volumes of aggregates measured separately, or, as in the case of laboratory tests, by weight.

The common practice of describing concrete as 6 to 1 or 8 to 1 has probably crept in through the use of dredged ballast where the stone and sand is in combination, and is, in the author's opinion, worthy of more attention from engineers than is often devoted to it, in order that a strict definition of what is really meant may be arrived at.

Judging from his own experience, the author is of opinion that such a description assumes more than it actually describes, and lends itself to an interpretation (to some extent established by long practice) that conduces more to economy in the interest of the contractor than to the efficiency of the work the specification is designed to safeguard.

These results are the outcome of the common practice of measuring the volumes of sand and stone in combination, and the very casual regard paid to the degree of solidity or proportion of voids to be filled with the binding materials in the sand, and the voids in the larger aggregates to be again filled with the finer component materials which may be described as mortar, both of which points will have an intimate effect in the strength, permanency, and impermeability of the finished mass of concrete.

In order to explain this more clearly, the author has appended details of a specification in common use on the Continent, which shows the result of each method of measuring and proportioning the volumes referred to

1 volume of cement
3 „ sand
5 „ stone

Mixture.	Ascertained weights per cubic metre.	Equivalent volumes of 1 cubic metre in finished concrete.	Total volume of ingredients in mixture.
cbm.		cbm.	cbm.
1·0 cement	1500	0·479	0·479
3·0 sand	1500	0·600	1·800
5·0 stone (gravel, broken stone)...	1500	0·600	3·000
0·64 water	1000	1·000	0·640

9·64 cubic metres. Density = 0·9.
Total, 5·919 cubic metres finished concrete.

5·919 represents the total solid volume of the ingredients.

These proportions, although quite a common specification, are of rather doubtful merit, as they will not give a dense resultant concrete even at the low percentage of 40 per cent. of voids in the separated aggregates, which are assumed for the purposes of calculation.

If the stone and sand are measured in combination, the proportions of sand being $\frac{3}{8}$ and the stone $\frac{5}{8}$ of the whole with 1 volume of cement and the proportionate volume of water, the result is—

Mixture.	Ascertained weights per cubic metre.	Equivalent volumes of 1 cubic metre in finished concrete.	Total volume of ingredients in mixture.
cbm.		cbm.	cbm.
1 cement.....	1500	0·479	0·479
8 { sand 4·65	1500	0·600	2·190
8 { stone 7·33 (gravel, broken stone) .	1500	0·600	4·410
9 water	1000	1·000	0·900

Density = 0·74.
Total, 7·979 cubic metres finished concrete.

7·979 represents the total solid volume of the ingredients, but again, like the former illustration, the concrete is not dense, and the actual volume in the latter the density will be less owing to the proportionately greater volume.

The density of 1 vol. cement, 3 vols. sand, 5 vols. stone, and 6 water is

$$\frac{\text{binding materials } 1{\cdot}119}{\text{voids } 1{\cdot}200} = \begin{cases} 0{\cdot}9\text{; } 0{\cdot}1 \text{ represents volume of unfilled voids.} \end{cases}$$

The density of 1 vol. of cement, 4·65 vols. sand, 7·33 of stone, and 9 water is

$$\frac{\text{binding materials } 1{\cdot}379}{\text{voids } 1{\cdot}860} = \begin{cases} 0{\cdot}74\text{; } 0{\cdot}26 \text{ represents volume of unfilled voids.} \end{cases}$$

It must be borne in mind that there is the same quantity of cement to 7·979 as to 5·919, an item of special interest to the contractor when the work is measured up.

By the rule that the density is the quotient of

$$\frac{\text{binding materials}}{\text{voids}}$$

it is easy to ascertain the density of any mixture.

The information of total volumes may be worked out for mixtures in any proportion by a similar method.

The figures representing weights and volumic equivalents are the means of hundreds of tests made by the Berlin Testing House, and any slight variation would not materially affect the comparative result of the illustration given.

It will be noticed that in fixing the volumic value of cement, a cubic metre of cement of a fineness which approximates with our British Standard Specification, which, when run into the measure to weigh 1,500 kilos, will give a resultant volume of 0·479 in the finished concrete, therefore the voids are approximately 52 per cent.

In like manner the aggregates are taken as graded to contain 40 per cent. of voids separately, and of a specific gravity that will give 1 cubic metre to weigh 1,500 kilos, and the resultant volume is 0·600.

In a specification recently compiled by one of the principal engineering firms who design reinforced concrete structures, there are indications which tend to show an apreciation of the necessity to deal with some of the defects common to concrete specifications.

In this specification the volume of cement is specified by weight, and the aggregates by measure, but the author claims that a specification based upon the data given in the illustration, which the author has tried to explain, will give more certain results and leave less to the ingenuity of the clerk of works or the contractor.

From this basis of calculation the cost per volume of finished concrete may also be correctly ascertained with a degree of exactness not attainable with the methods at present in common use.

Ascertaining Proportion of Voids in Aggregates.

These may be calculated by taking the main specific gravity, and comparing this with the ascertained weight per volume.

The difference will represent proportion of voids.

A readier method that may be adopted on the works, which will give approximately the same results, is the measurement of volumes of aggregates dry, and the addition of a measured quantity of water sufficient in the case of stone to submerge it, and in the case of sand to reach the mark of the sand when run in before the water is added.

It will be seen from these methods of calculation that the required proportion of binding media is obtained from the finished volume of concrete, instead of, as is the common practice, estimating it from the unfinished materials in a dry state. It is needless to point out that the latter method cannot be depended upon with nearly so great a degree of certainty as to results.

It is a debatable point if any ultimate degree of strength is gained by the addition of an excess of binding materials beyond the amount necessary to completely fill the voids in the aggregates, adding a small margin to allow for imperfect mixing, which will vary as to the conditions under which the actual work is done.

A number of tests, extending over many years, made by the Municipal Engineer of Coln, go to prove that there is the strongest evidence in support of the uselessness of adding binding materials in excess of the voids.

This being admitted, and having regard to other common-sense reasons already advanced, it points to the conclusion that it would be advantageous to pay a little additional attention to the selection and grading of aggregates, and the cost of so going would be defrayed by the saving effected in the more expensive binding materials. A greater degree of efficiency would also be assured from the basis of calculations of density the author has described.

Given the strength and form of the unit to be favourable, the tensile strength of the mass will follow the ratio of density, and the compression strength will be usually about fifteen times the tensile strength at any given period.

In regard to the subject of density, it is always necessary that the mortar, *i.e.*, binding materials and sand, should be dense for whatever purpose it is required, but it is not always so necessary that the mortar should completely fill up the voids in the stone aggregates of concrete. This is especially the case when impermeability is not necessary.

Greater strength is secured by a strong mortar that does not completely fill the voids than with a weaker mortar that secures that result.

It is found that a mixture of 1 volume of cement, 3 volumes of sand, and 6·5 volumes of stone gives the same strength as 1 volume of cement, 3 volumes of sand, and 5 volumes of stone. Also 1 volume of cement, 4 volumes of sand, 8 volumes of stone gives the same strength as 1 volume of cement, 4 volumes of sand, and 6 volumes of stone.

Volume of Water.

The proportion of water which will enter into chemical combination with concrete varies slightly in different mixtures and with different makes of cement, but it may be taken for practical purposes at 15 per cent. of the volumes of binding materials and sand.

This quantity is not, however, sufficient to allow for evaporation, absorption, and consolidation, but the excess required will be governed by temperature and other conditions of environment.

There can, however, be no room for a divergence of opinion in regard to sloppy or dry concrete, as an excess in either direction will defeat the necessary object of securing that there is a perfect distribution of all the component ingredients of the concrete throughout the mass when placed in its ultimate position.

Mixing of Concrete.

The practice which commonly obtains of mixing all the concrete materials dry, either by hand or machine, has nothing to recommend it beyond that it is a little less troublesome, whilst it is opposed to reason that the most perfect distribution of all the particles can be secured by that process.

It would appear more reasonable to secure a perfect mixture of the smaller particles as a first part of the process, and this may be obtained by mixing the binding materials, sand and water, in a mortar pan and rollers, or a machine that will secure like results.

The superiority of machine-made mortar over the hand-made variety requires no illustration beyond the common-sense knowledge—that a perfect and equal distribution of all the constituent particles must of necessity give better results than a less perfect intermingling.

The mortar thus obtained should then be mixed with the stone aggregate, the latter being wetted to cause the mortar to adhere by the prevention of undue absorption of water from the mortar on the otherwise dry surface of the stone.

The mixing of the mortar with the stone can be most efficiently accomplished in a rotary mixer, this process being limited to the distribution of the mortar equally throughout the stone aggregates.

If the process stops short or goes beyond this point it may result in the undoing of some of the work already achieved, and for similar reasons care is necessary in the transit of the wet concrete to its ultimate position.

If it is inconvenient to use a rotary mixer, and this part of the process is performed by hand, the same care should be exercised, and for this reason a long banker, on which the materials can be laid out two or three shovels wide, and turned over from both sides, will give much better results and effect a saving in labour which cannot be obtained by the usual practice of dumping the materials in a large circular heap and turning it over to another position—whilst the water thrown on with a bucket washes some of the cement to the bottom or through the open joints of the banker planks on to the ground beneath.

The mixing of concrete provides an example of the axiom that an ounce of practical experience is worth a ton of theory, and much of the former is lost by treating this very important matter as the work of an unskilled labourer with a "perforated" specification to guide him.

In conclusion, the author submits that all the elaborate and often necessary precautions exercised in the selection of Portland cement, and the most accurate and involved calculations of the engineering office and laboratory, may be rendered ineffective if the results of these are ultimately handed over to the contractor, his navvy ganger, or the navvy himself, to select the aggregate under the most casual process of supervision and mix the concrete in the manner most suited to his convenience.

It is quite a common experience to find that when the work after completion is found unsatisfactory, the blame is attached to the cement, when the fault really is with the aggregates used and the imperfect methods employed in mixing them.

Legal Column.

The Development and Roads Improvement Funds Bill.

The Development and Roads Improvements Fund Bill seems to be a somewhat extraordinary measure. Sums annually voted by Parliament, and five instalments amounting to 2,500,000*l.* charged on the Consolidated Fund, appear to be given to the Treasury in the form of a blank cheque for the purpose of aiding and developing forestry agriculture and rural industries, the reclamation and drainage of land, the improvement of rural transport—other than roads, but including light railways—the improvement of harbours and canals, and for any other purpose "calculated to promote the economic development of the United Kingdom." The Bill also creates a Road Board, which has powers to construct new roads which are to be confined to motor traffic, except in so far as other kinds of traffic are licensed to use them on making a payment for such licence.

Primâ facie, this limitation of the use of such roads is to be justified by the fact that the duties on motor spirit and the licences on motor-cars are to be devoted to their construction and maintenance; but the matter does not stop there, as, according to the explanatory Memorandum, compulsory powers identical with those under the Small Holdings Act are to be conferred not only for the acquisition of the land required for the roads, but in rural districts to the extent of 220 yds. on each side of the road. This expropriation of private rights is commended to the landowner by the Memorandum in the following terms:—

> "This power will enable the Road Board to a great extent to reap the increment in value of lands adjoining the new motor roads due to the construction of these roads, and it is hoped that this source of revenue, as well as the charges for allowing private roads leading to houses in the neighbourhood to communicate with the new motor roads, may go some way towards recompensing the Road Board for the expenditure on the construction and maintenance of the new motor roads."

We can hardly imagine that there will be much competition to live by the side of the motor roads, but the Road Board have powers to sell, lease, or manage those lands and no doubt will sanction the erection of less desirable buildings on the land they have acquired compulsorily, and another element of subsidised competition is hereby introduced. The railway companies when they acquire land are confined to taking land necessary for their statutory undertaking, but these Road Boards are to be empowered not only to acquire land for the roads, but the whole of the frontage upon them. The Memorandum concludes with the observation that in making grants under either part of this Bill regard shall be had to the general state and prospects of employment; or, in other words, indicates that the works may be carried out with "unemployed" labour as relief works. The interests of builders and contractors are ignored, and the landowner is to be despoiled, whilst the country is to be defaced. The Finance Bill would appear sufficiently to have effected these interests without the introduction of this further measure.

The Patents and Designs Act.

According to a statement which recently appeared in the *Times* as to the operation of sect. 27 of the Patents and Designs Act, 1907, which has now been in force twelve months, sixty-nine applications for revocation were made to the Comptroller-General, out of which orders for revocation were made in ten cases. On appeal the High Court reversed two decisions, leaving only eight cases of revocation. In one case the Comptroller made an order for conditional revocation, twenty-eight applications were withdrawn and twenty-six are still pending.

As the *Times* remarks, it is too soon yet to determine whether or not the Act will deter foreigners from applying for patents in this country. The above figures also, of course, give no intimation of the real operation of the Act, as to whether it exerts any practical influence in encouraging industry in this country. In many of the cases, and notably in that we commented upon last week, the evidence has shown that the demand in this country for the patented article or product is very small, but probably in cases where any substantial demand exists the patentees have taken steps on their own initiative to manufacture here, and therefore only the least important cases from this point of view have come before the Comptroller.

LONDON AND DISTRICT BOROUGH COUNCILS.

Heston and Isleworth.—Dr. E. J. Steegmann, the Medical Officer of Health, reports that in November, 1904, a system was adopted by which the drains of all new houses are tested by the sanitary inspectors as well as by the Surveyor's Department before a certificate is given by the Surveyor that the houses are fit for occupation. In the four years during which the system has been in force drains were tested as follows:—1905, 504 houses, defects 77 per cent.; 1906, 530 houses, defects 31 per cent.; 1907, 376 houses, defects 32 per cent.; 1908, 150 houses, defects, 38 per cent. The carrying out of the regulation made a considerable increase in the work of the sanitary inspectors, but its value is undoubted.

Watford.—The annual report of Dr. Arthur King, the Medical Officer of Health, states that 280 houses were built in the district during the year, and although there was a larger proportion of middle-class dwellings amongst these than usual, more than one-half of the houses were for the working class. The average artisan is well provided with house accommodation, and it is the low-waged labourer that cannot get housed at a sufficiently low rent, whose requirements are not well attended to. Work on the old sewers has been going on during the last two years, and much still remains to be done before things can be got in a thoroughly satisfactory condition. At the time of writing sewers needed attention in thirty-six roads, and many new ventilation shafts were necessary.

PROJECTED NEW BUILDINGS IN THE PROVINCES.

ABERCARN.—School; Mr. J. Bain, architect, Shire Hall, Newport, Mon.

Aberllefenni.—School (eighty places); architect, care of Mr. H. Hadyn Jones, Secretary, Merionethshire Education Committee, Towyn.

Abersychan. — Swimming-baths; Surveyor, Urban District Council, Abersychan.

Ashton-under-Lyne. — Hospital (30,000*l.*); Town Clerk, Ashton-under-Lyne.

Atherton.—Additions to workhouse, for the Guardians.

Beams.—School; Messrs. Cleary & Charlton, builders, Sunderland.

Belfast.—Stores for the Great Northern Railway (8,000*l.*); Mr. W. Dowling, contractor, Belfast.

Birmingham (Tyseley).—Shops; Mr. H. M. Pumfrey, builder, Bourneville.

Blundeston.—Chapel, for Wesleyan Methodist Trustees.

Boothstown.—Additions to mills, for Messrs. W. Yeates & Son, Worsley.

Brighouse.—Additions to mill; Messrs. Welsh & Nicholas, architects, Museum-chambers, Halifax.

Chatham.—Additions, Royal Sailors' Home; Mr G. Bond, architect, Chatham.

Clydebank.—Library (10,000*l.*); Surveyor, Town Council.

Coleraine.—Mission hall; Mr. Vincent Craig, architect, Belfast; Mr. W. Dowling, builder, Belfast.

Cornwall.—School (St. Burgan); Mr. G. Miners, builder, Marazion.

Crumlin.—School; Mr J. Bain, architect, Shire Hall, Newport, Mon.

Delaval.—Schools, New Delaval Colliery; Mr. J. Forrest, architect, Moot Hall, Newcastle-on-Tyne.

Dromfield.—Pavilion; Secretary, Hallowes Golf Club.

Eastleigh.—Church; Mr. J. Colson, architect, Winchester; Messrs. Musselwhite & Sapp, builders, Basingstoke.

Eccles. — School; Park-road, Monton (12,500*l.*); Messrs. William Nicholson & Son (Leeds), Ltd., builders. The Town Council has passed the following plans:—Grocer's shop, Thorp-street, Peel-green, for the Eccles Provident Industrial Co-operative Society, Ltd.; eight houses, Beech-street, Winton, Mr. W. A. Norman; two houses, Gleaves-road, Mr. John Lomax.

Edenderry.—Banking premises, for Hibernian Bank, Ltd., Dublin.

Elham.—Infirmary, for the Guardians, Elham.

Gellygaer.—Twenty houses, for Powell Dyffryn Company.

Gillingham.—Public convenience (250*l.*); Borough Surveyor, Gillingham.

Goodwick.—Church; Mr. E. M. Bruce Vaughan, architect, Dumfries-place, Cardiff.

Goole.—Skating-rink, for the Philadelphia Roller Skating Company, The Boulevard, Hull.

Horden.—School; Mr. J. Taylor, architect, The Castle, Winchester.

Hull.—School, Sauer-street; Mr. H. Hirst, City Architect.

Inverness.—Rink; Mr. Macrae, architect, Arcade Rink Company, Aberdeen.

Kilmuir. — United Free Church manse (1,000*l.*), for the Trustees.

Kirkcaldy.—Converting church into school; Mr. Birrell, architect, Kirkcaldy.

Kirktown.—Additions to school; Mr. A. Duncan, architect, Turriff, N.B.

Lanesfield. — Wesleyan church; Messrs. Manton & Son, architects, Wolverhampton.

Llanelly.—School; Borough Engineer, Town Hall.

Maesteg.—School; Mr. W. Nash, architect, Angel-street, Neath.

Manchester.—Rink (6,000*l.*); Mr. G. R. Ward, architect, 71, Colmore-row, Birmingham.

Margam.—Twenty-four houses; Bryn Building Club, Margam.

Market Harborough.—Additions, police-station, and house, for Leicestershire County Council.

Melin.—Additions to school; Mr. W. Jenkins, architect, Guildhall, Neath.

Merionethshire. — Alterations to Higher Grade School; architect, care of Mr. H. Hadyn Jones, Secretary, Merionethshire Education Committee, Towyn.

Mossley.—School; Mr. F. Farmer, architect, Stalybridge.

Motherwell.—Church; Mr. H. Harper, architect, Longlow, Nottingham.

Nantwich.—Sanitorium, for the Guardians.

Newcastle.—Premises for Messrs. Tiller & Co., Newcastle; Mr. G. Errington, architect, Grainger-street, Newcastle.

Newcastle.—Technical block at Rutherford College (15,000*l.*); Messrs. Middlemiss Bros., builders, Newcastle.

Newington.—Additions to church schools; Mr. A. Allen, architect, Bridge-street, Banbury.

Newport.—Wesleyan church; Mr. A. Lander, architect, The Strand, Barnstaple.

Oldham.—Rink, Park-road, for the Kensington Roller Skating Company, Ltd., Oldham.

Paisley.—New works for Messrs. Arrol Johnston Car Company, Ltd., Paisley.

Ponteland.—Additions to workhouse, for the Guardians.

Portsoy, N.B.—School (4,000*l.*); Mr. J. Christie, architect, Fife-street, Banff.

Radcliffe.—United Methodist church, Ainsworth-road, for the Trustees.

Rathdown (Dublin).—Offices, board-room, for the Guardians.

Seaham Harbour. — Primitive Methodist church (3,000*l.*); Mr. Curry, builder, Seaham Harbour.

Southend-on-Sea.—Church school; Mr. J. C. Flexman, builder, Southend.

South Shields. — School, Langley-park; Messrs. Sherriff & Son, builders, South Shields.

Spennymoor.—Additions to school; Mr. Moore, builder, Shildon.

Sutton-in-Ashfield. — School, Forest-lane; Messrs. Fish & Son, builders, Pilchergate, Nottingham.

Swinton.—Church; Mr. A. E. Lambert, architect, 22, Park-row, Nottingham.

Tamworth. — Additions to workhouse (12,000*l.*); Mr. T. H. Clifford, builder, Glascote.

Tredegar.—Parish hall; Mr. G. Kershole, architect, Bargoed.

Worcester.—Houses, Wylds-lane; Mr. G. Kimber, builder, Bath-road, Worcester.

Worksop. — Church buildings, Newcastle-avenue; Trustees, Priory Church.

Worsley.—Additions, Wardley Mill, for Messrs. Burgen, Ledward, & Co., Worsley.

Competition News.

ELTHAM PARISH HALL.

There are about 180 entries in this competition. Mr. G. Nelson Prior is the Hon. Secretary of the Committee in charge of the matter.

General Building News.

ST. MARY'S CHURCH, STAMFORD.

The tower of St. Mary's Church, Stamford, surmounted by a fine XIVth century spire, is in serious need of repair. In the year 1788 steps were taken to strengthen the building, and the masonry is now almost dependent upon the iron bands which were at that time placed round the tower. Mr. W. Weir, the Architect of the Society for the Preservation of Ancient Buildings, and Mr. H. F. Traylen, of Stamford, have lately made a thorough examination of the edifice. They report that the tower is really in danger, and that steps should be taken to strengthen it as speedily as possible if the building is to be saved. The Committee took the opinion also of Mr. T. G. Jackson, R.A., who, having made a careful investigation, fully confirms the urgency of the work, and has offered to inspect the work of restoration, so that every precaution will be taken to insure the undertaking being carried out in the most careful way and by the most approved methods. The superintendence of the work has been entrusted to Mr. Traylen, to be carried out as soon as the necessary funds are raised. With the exception of pointing, replacing the finials, and the restoration of the top of the spire, the repairs will be almost entirely confined to the inside of the tower walls, so that the external beauty of the building will be in no way interfered with. The cost of the restoration will be at least 1,250*l.*, and the Committee appeal to all who are interested in this beautiful building to help as liberally as they can in carrying out the scheme. Subscriptions may be sent to the Stamford, Spalding, and Boston Bank, Stamford, to the "St. Mary's Church Restoration Fund."

BALLINGHAM CHURCH, NEAR HOLME LACY.

Repairs are to be made to the parish church of Ballingham, which is situated about three miles from Holme Lacy Station. Mr. W. E. H. Clarke, architect, of Hereford, has prepared plans, which Messrs. Beavan & Hodges, builders, of Hereford, are to execute.

U.F. CHURCH, CARR-BRIDGE.

The members of the U.F. Church at Carr-Bridge have opened a new church. The main part of the building is seated for about 300, while there is an annexe for eighty-four. The seating is of pitch-pine, with chairs in the annexe, the chairs being supplied by the North of England School Furnishing Company, Darlington. The architect for the building was Mr. Alex. Cullen, Hamilton, and the local architect was Mr. Cattanach, Kingussie. The contractors were:—Mason, Mr. Duncan Grant, Carr-Bridge; carpenter, Mr. Alexander Maclean, Carr-Bridge; plumber, Mr. James Nisbet, Inverness; slater, Mr. John Reid, Inverness; plasterers, Messrs. L. & R. Macpherson, Kingussie; painters, Messrs. A. Ferguson & Co., Aberdeen.

MEMORIAL CHAPEL, PRESTATYN.

A memorial chapel to the late vicar of Prestatyn is to be built in connexion with the parish church; it will provide extra accommodation for about forty-five persons, and a vestry. The architects are Messrs. Prothero, Phillott, & Barnard, of Cheltenham, who are now calling for tenders.

SECONDARY SCHOOL, BRIGHOUSE.

The memorial-stones were recently laid of a block of new premises designed expressly as a secondary school for girls, and also to meet the requirements of the Brighouse Pupil Teachers' Centre, as well as to provide facilities for instruction in evening class technical subjects. The accommodation to be provided in the new building is for about 150 day and 400 evening class students. Acting on the advice of the adjudicator, Mr. J. H. Woodhouse, of Manchester, the governors selected the competition designs of Messrs. Sutcliffe & Sutcliffe, architects, Hebden Bridge. The whole scheme is expected to involve an expenditure of about 10,000*l.* The various contractors are as follows:—Masons, Lister Brook & Co., Brighouse; joiner, Wm. Halliwell, Brighouse; painting, E. Harland & Sons, Bradford; plasterer, Albert Firth, Brighouse; plumber, A. L. Waddington, Brighouse; slater, Jas. Smithies, Brighouse; asphalting, Albert Kershaw, Brighouse; electricians, S. Hodgson & Co., Halifax; concretors, Hennebique Company, Hull.

SCHOOL, SCUNTHORPE.

A new higher elementary school, built by the Lindsey County Council, to accommodate 240 children, and as a centre for seventy-two pupil teachers, has just been opened. There are two blocks of buildings, including a science laboratory and a metallurgical laboratory for the boys, and a laundry and cooking school for the girls. The cost of the buildings is about 10,000*l.* The architects for the school are Messrs. Scorer & Gamble, Lincoln, and the contractors Messrs. H. W. Parker & Son, Boston.

COUNCIL SCHOOL, DARNALL, SHEFFIELD.

A new Council school has been opened in Whitby-road, Darnall. The building provides accommodation for 390 scholars in the mixed department, and 120 junior scholars and 300 infants, a total of 810. The total cost of site, buildings, and furniture is 14,762*l.*, or 18*l.* 4s. 7d. per school place provided. This expenditure covers the provision of two large central halls, at an estimated cost of 1,691*l.* The architects were Messrs. Potter & Sandford, and the contractors Messrs. T. Wilkinson & Son.

COUNCIL SCHOOLS, GREAT HARWOOD.

The new Western Council schools at Great Harwood have now been opened. The buildings comprise an infants' department, a mixed

school, and a technical block—all three separate structures, and have involved a cost exceeding 18,000*l.* The general contractor for the work is Mr. B. Lumb, of Todmorden, the plans being prepared by Mr. Hy. Littler, County Architect, whilst the clerk of the works is Mr. G. E. Smirk. The sub-contractors are:—Joinery, Mr. I. Taylor, Keighley; slating, Mr. E. Welch, Accrington; plumbing and painting, Mr. R. Hartley, Great Harwood; ventilating engineers, Messrs. H. Hargreaves & Sons, Bury; gas lighting, Messrs. Stott & Co., Oldham; sanitary fittings, Messrs. G. & E. Musgrave, Ltd., Liverpool; heating, Messrs. Newton, Chambers, & Co., Ltd., Manchester; plastering, Messrs. Rawlinson & Sons, Burnley; wall tiling, Messrs. Conway & Co., Manchester; and granite setts, the Threlkeld Granite Company, Keswick.

SUNDAY-SCHOOL AND CHURCH INSTITUTE, PARTINGTON.

A Sunday-school and church institute has been opened for the parish of St. Mary, Partington. The architects were Messrs. John Bowden & Co., of Manchester, and the contractors, Messrs. Brew Brothers, of Cadishead.

OPERA-HOUSE, GUATEMALA.

We learn from the *Board of Trade Journal* that the *Handelsberichten* (the Hague) of August 12 announces, on the authority of the Dutch Consul in Guatemala, that the Guatemalan Legislature have decided to build a new opera-house having a seating capacity for 2,500 persons. The building is to be constructed on modern lines.

AMBULANCE-STATION, BURNOPFIELD.

An ambulance-station has been built for the Burnopfield division of St. John's Ambulance Brigade. Mr. Heslop, Surveyor to Tanfield Council, was the architect for the station, and the contractors were Messrs. Davison & Son, of Burnopfield.

MENTAL HOSPITALS, TOXTETH.

The Toxteth Board of Guardians have added to the Smithdown-road Workhouse two blocks, which are to serve as mental hospitals for 200 males and 100 females. The complete cost of both buildings, including furnishing, fire mains, hydrants, and heating, is about 20,000*l.* The architect was Mr. Walter W. Thomas. Mr. Henry Hallard acted as clerk of the works.

NEW BUILDINGS AT BOTHWELL.

There is at present in course of erection at Bothwell a large chapel school for the Roman Catholic community of Bothwell and Hamilton Palace Colliery districts. The school is estimated to cost 8,000*l.* There is also in course of erection adjoining the fountain, Bothwell, a group of buildings to be known as the Donald Institute, the ground and cost of buildings being gifted to the village by the late James Donald, a native of Bothwell. Owing to the abnormal growth of Bothwell Haugh the School Board have found the school accommodation quite inadequate to cope with the demands, and schedules have been issued for the erection of a second school on ground nearly opposite the local store, and the work will be proceeded with at once. There is also at present a petition submitted to the Bothwell School Board to erect a school at Bothwell Park, a large colliery district midway between Bellshill and Uddingston.

CLUB PREMISES, COXLODGE AND GOSFORTH.

It is proposed to start a social club in this neighbourhood, and designs have been prepared by Messrs. Gibson & Stienlet, North Shields, for this purpose. It is intended to expend 2,800*l.* on the building and furnishings.

TRADE NEWS.

MESSRS. E. A. ROOME & Co., builders and contractors, of Basinghall-street, E.C., and Crown Works, Homerton, N.E., have secured the contract to pull down and rebuild the Prince Arthur public-house at Lee, for Messrs. Watney, Combe, Reid, & Co., Ltd., under the supervision of their architect and surveyor, Mr. M. T. Saunders.

The Columbian Fireproofing Company, Ltd., have secured a 14,000*l.* contract for nearly five miles of high-pressure water pipes, 24 in. diameter, on the "Bonna" system of reinforced concrete, for the Corporation of Swansea, under the general contractors, Messrs. J. Aird & Son. In addition to the above the company are constructing the "Bonna" pipes, 18 in. diameter, for the Clydebank Water Trustees (19,000*l.*), also for the Belfast Corporation, 21 in. diameter (1,700*l.*).

The Victoria Schools, Ebbw Vale, are being ventilated by means of Shorland's patent exhaust roof ventilators, supplied by Messrs. E. H. Shorland & Brother, of Manchester.

Miscellaneous.

SLATING.

In the letter of "Argus" (p. 245 *ante*) the sentence "dropped into the gutter as shown," should have read "*dressed* into the gutter as shown."

REGENT-STREET POLYTECHNIC.

In the announcement regarding the Day School of Architecture at the Regent-street Polytechnic, the directors explain that this special department has been formed for the purpose of affording instruction to youths and young men who intend entering architects', surveyors', or builders' offices, or following any of the many designing and constructive industries where an architectural training constitutes the best and surest basis for future success. The course will cover a period of two or three years, and will include instruction in architecture, architectural design, building construction, land surveying, freehand, model and perspective drawing, measured drawing, modelling in clay, decorative design, figure composition, and historic ornament. There will also be the preparation of "Testimonies of Study," as required by the Royal Institute of British Architects and the schools of the Royal Academy, plane and solid geometry, building quantities, sanitary science, and, in addition, a thorough course in construction, including the chemistry of building materials.

THE MOSCOW CIRCULAR RAILWAY.

The circular railway round Moscow, which has been in construction for many years, and has cost many millions of roubles, has been completed and opened. The results, however, have been anything but satisfactory. Firstly, as regards passenger traffic, owing to the high fares and even more owing to the stations being often built in the middle of fields without any means of getting to them, the line has proved a complete failure. The number of passengers was absolutely ridiculous—a few dozen per month—and in the autumn it was decided to suspend traffic. Affairs are but little better as concerns goods traffic. Owing to the exceptionally high and unsatisfactory tariff, every merchant who can possibly manage it avoids using the line for transporting his wares. In a word, the line has in no way fulfilled the expectations of the Government, which financed the undertaking. Seeing that affairs are in a hopeless state, the Government is going to revise the tariff, when possibly the line may begin to exercise the influence hoped for by the constructors, which it undoubtedly should exercise. It is to be hoped that the circular railway will soon be adapted for passenger traffic, as it is considered it would largely help to solve the housing problem. The population of Moscow is steadily increasing by about 39,000 per year (the total in January last was 1,440,000), while of late the building of new houses has virtually ceased. It was hoped that the new line would enable people to find cheaper houses outside the city, and have a convenient means of getting into town to their business. Needless to say, the rent of houses has been steadily going up of late years.

THE CANADIAN PACIFIC RAILWAY.

Work has just been completed on what the *Canadian Gazette* describes as the most colossal piece of tunnelling that has ever been attempted in Canada, in the finishing of the two famous spiral tunnels on the main line of the Canadian Pacific Railway between Field and Hector, British Columbia, which will add several miles to the length of the track, together with over a mile of tunnelling and a couple of bridges, but will so cut the "Big Hill" grade as to more than double the tractive power of the locomotives. It has meant the excavation of nearly three-quarters of a million cubic yards of rock, the employment of a thousand men for nearly two years, the boring of about a mile and a half of tunnels through mountains 10,000 ft. high, and the building of two bridges over the Kicking Horse River; but it will prove a good investment for the railway, as it will reduce this grade from 4·5 to a maximum of 2·2. The completion of this work means that the principal obstacle to the running of trains over the Rocky mountains has been removed, and that in future, on this section of the line, two engines will be able to do much more work than four engines have hitherto accomplished, and at a much less expense, and with a complete elimination of the risk to life unavoidable in operating trains on a steep grade. The cost of the improvement has been 1,500,000 dollars.

LINLITHGOW PALACE.

Following out a scheme begun some years ago with the object of preserving ancient royal buildings against the ravages of wind and weather, repairs are at present being carried out on certain parts of Linlithgow Palace. One apartment to which attention is being directed is the room in which Mary Queen of Scots was born. By these repairs which have been executed from time to time much has been done to preserve the more dilapidated parts of the historical landmark.

AN INVISIBLE SLATE CLIP.

Messrs. Korner-Greenwood & Co., of King's Lynn, send us a specimen and description of a slate-clip for fixing a slate on a roof in place of a damaged one. The slate is holed with a single hole about 2 in. from the centre line (to avoid drip on the clip from the joint of the superimposed slates), and a metal loop is passed through the hole in the slate and through a corresponding hole in the metal clip; the loop being wedged up with a short wedge-shaped nail, so as to fix the clip to the under side of the slate. The clip is a flat thin piece of metal about 1¼ in. wide with the lower end cut into sharp teeth, and with a bend downwards in the middle. When the slate is pushed up into position the clip is momentarily straightened out as it passes the batten, and after that resumes its bend and the teeth go into the batten. The device is simple and seems likely to be useful.

Patents.

APPLICATIONS PUBLISHED.*

16,194 of 1908.—George Nobes: Cowl or hood for chimney-pots, shafts, and the like.

20,502 of 1908.—William Thomas Lawman: Window-sash fastener.

21,346 of 1908.—Friedrich Assmann, Johann Heinrich Stupp, and Richard Hoppe: Latches for door locks.

21,749 of 1908.—Percy Richard Julius Willis: Lock-nuts.

24,776 of 1908.—Henry McKenzie and William Tivendale: Locks and latches.

25,374 of 1908.—Guillaume Dujardin: Ferro-concrete beams.

4,204 of 1909.—William Toombs: Construction of soundproof and fireproof floors and roofs.

4,441 of 1909.—George Henry Pedlar: Corrugated culvert or pipe sections.

8,807 of 1909.—Henry Ford Leslie: Metal bars for use in reinforced concrete constructional work.

12,551 of 1909.—Robert William Henry Rodney: Double bolt mechanism for doors, windows, casements, and the like.

SOME RECENT SALES OF PROPERTY: ESTATE EXCHANGE REPORT.

August 7.—By IRELANDS (at Norwich).
Seething, Norfolk.—Mere House Estate, 245 a. 0 r. 34 p., f. £4,200
August 12.—By HENRY THOMAS & Co. (at Penzance).
Ludgvan, Cornwall.—Part of the Trewarthenick Estate, 988 a. 2 r. 23 p., f. (in lots) 25,040
August 19.—By EDWIN J. GILDERS & Co. (at Clacton-on-Sea).
St. Osyth, Essex.—Whyers Hall Farm, 306 a. 3 r. 26 p., f. 5,250
Spring-rd., four cottages, f. 101
Spring-rd., six cottages, f. 245
Little Clacton, Essex.—Two enclosures of pasture, 28 a. 1 r. 28 p., f. 730
Clacton-on-Sea, Essex.—Skinner's Bungalow, f. 270
Trafalgar-rd., plot of land, f. 450
August 23.—By C. & B. WESTBROOK.
Shepherd's Bush.—59, Abdale-rd., u.t. 71 yrs., g.r. 5*l.*, gross rental 29*l.* 18*s.* 190
August 25.—By PHILIP & GEORGE GEEN.
Dulwich.—99, Henslowe-rd., u.t. 68 yrs., g.r. 5*l.* 10*s.*, w.r. 33*l.* 16*s.* 165
By WYATT & SON (at Chichester).
East Wittering, Sussex.—Coastguard station and store, 1 a. 3 r. 33 p., f. 930
Chichester.—16, Cavendish-st., f. 130
By JAMES ELEY (at Boston).
Skirbeck, Lincs.—House and enclosures, 14 a. 3 r. 2 p., f. 1,360
August 26.—By CHARLES SPARROW & SON.
Kentish Town.—16, Crown-ter., u.t. 46 yrs., g.r. 4*l.*, w.r. 30*l.* 180
Highgate.—30, Cromwell-av., u.t. 70½ yrs., g.r. 9*l.*, y.r. 45*l.* 395
Wood Green.—62 to 72 (even), Nightingale-rd., f., w.r. 176*l.* 16*s.* 1,475
Tottenham.—118 to 126 (even), Clyde-rd., u.t. 144½ yrs., g.r. 8*l.* 8*s.* 4*d.*, w.r. 110*l.* 10*s.* 630
By WYATT & SON (at New Shoreham).
New Shoreham, Sussex.—Meadow land, 6 a. 2 r. 22 p., f. 750

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. beerhouse; p.h. for public-house; o. for offices; s. for shops; ct. for court.

* All these applications are in the stage in which opposition to the grant of patents upon them can be made.

List of Competitions, Contracts, etc.

For some Contracts still open, but not included in this List, see previous issues. Those with an asterisk (*) are advertised in this Number: Competitions, iv.; Contracts, iv. vi. viii. x.; Public Appointments. xv.; Auction Sales, xxii.

Certain conditions, beyond those given in the following information, are imposed in some cases, such as: the advertisers do not bind themselves to accept the lowest or any tender; that a fair wages clause shall be observed; that no allowance will be made for tenders; and that deposits are returned on receipt of a bonâ-fide tender unless stated to the contrary.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

***** It must be understood that the following paragraphs are printed as news, and not as advertisements; and that while every endeavour is made to ensure accuracy, we cannot be responsible for errors that *may* occur.**

Competitions.

SEPTEMBER 28.—**Lyminge.**—SEWAGE DISPOSAL.—The Elham R.D.C. invite schemes and estimates for the disposal of the sewage of Lyminge Parish. Mr. R. Lonergan, Clerk, 11, Cheriton-place, Folkestone.

OCTOBER 1.—**Aberdare.**—HOSPITAL.—The U.D.C. of Aberdare invite competitive designs for a fever hospital for fifty-two patients, including administrative block, outbuildings, etc. Premiums of 100*l*., 50*l*., and 25*l*. are offered for the designs placed first, second, and third respectively. An architectural assessor will be appointed on the nomination of the President of the Royal Institute of British Architects, also a medical assessor to act jointly. Particulars, etc., of the competition, together with a plan of the site, may be obtained from Mr. Thomas Phillips, Clerk, Town Hall, Aberdare, on payment of a sum of 3*l*. 3s.

OCTOBER 11.—**Hull.**—TRAINING COLLEGE.—The Hull Education Committee offer premiums of 150*l*., 100*l*., and 50*l*. for drawings submitted in competition for a new college. For further particulars see advertisement in our issue of July 24.

NOVEMBER 1.—**Kendal.**—TECHNICAL SCHOOL.—The Corporation of the Borough of Kendal invite architects residing and practising in Westmorland to submit a competitive design, together with a written description and estimate for the erection of a technical school in the said Borough. A premium of 15*l*. is offered for the design considered by the Corporation first in order of merit, and further premiums of 10*l*. and 5*l*. respectively for those which are, in their opinion, second and third in order of merit; such designs, on payment of the promised premiums, shall become the absolute property of the Corporation. Particulars, etc., together with the plan of site, showing levels, etc., may be obtained free, on application to the Borough Surveyor. (Mr. J. E. Bolton, Town Clerk.)

* NOVEMBER 1.—**Preston.**—GRAMMAR SCHOOL.—The Corporation of Preston invite designs for new grammar school in Moor Park-avenue, Preston. Three premiums are offered. See advertisement in this issue for further particulars.

NOVEMBER 30.—**Herne Bay.**—PAVILION ON PIER.—The Herne Bay U.D.C. invite designs for pavilion on pier. Two premiums are offered. For further particulars see advertisement in our issue of August 28.

JANUARY 31. — **Cardiff.** — NATIONAL MUSEUM.—The Council invite competitive designs for the erection of a new National Museum at Cardiff. Premiums of 200*l*., 150*l*., and 100*l*. for second, third, and fourth places. Particulars on receipt of a deposit of 2*l*. 2s. from Dr. Wm. Evans Hoyle, Director of the Museums, City Hall, Cardiff. For further particulars see advertisement in our issue of August 28.

Contracts.

BUILDING.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

SEPTEMBER 5.—**Cardiff.**—ALTERATIONS, ETC.—Tenders are invited for alterations and additions to No. 80, Queen-street, Cardiff, for Mr. J. B. Stephens. Plans and specification to be seen at office of Mr. J. B. Stephens, solicitor, 80, Queen-street, Cardiff.

SEPTEMBER 6.—**Aberdeen.**—NEW ACCESS.—Aberdeen T.C. invite tenders for the joiner and other works (combined schedule) in the provision of a new access from the Gymnasium, Poynernook-road. Specifications, etc., may be obtained from Mr. Wm. Dyack, Burgh Surveyor, Town House, Aberdeen.

SEPTEMBER 6.—**Calverley.**—HOUSE.—Tenders are invited (all trades except painter's) for erection of small house at Calverley. Plans, etc., seen, and quantities obtained, at the office of Mr. Horace E. Priestley, M.S.A., 17, Bertram-road, Bradford.

SEPTEMBER 6.—**Holmfirth.**—TEACHERS' ROOM, ETC.—The District Sub-committee, West Riding C.C., invite tenders for the erection of a teachers' room at the Hade Edge Provided School, also for reslating part of the roof of the school. Specifications may be obtained at the office of Mr. W. Heeley, Town Hall, Holmfirth.

SEPTEMBER 6.—**West Hartlepool.**—CONCRETE WALL.—The Hartlepool Port Sanitary Authority invite tenders for the construction of a concrete wall and other works at the Infectious Diseases Hospital. Plans and specifications may be seen, and any further information obtained, at the office of the Authority's Surveyor, Mr. J. W. Brown, Church-square, West Hartlepool, between 10 and 11 a.m.

SEPTEMBER 8.—**Barrow-in-Furness.**—WASH-HOUSE, ETC.—The Guardians of the Parish of Barrow-in-Furness invite tenders for the erection of a wash-house and store-room at the Cottage Homes, Roose-road. Plans, etc., may be inspected, and bills of quantities obtained, at the office of the architect, Mr. H. T. Fowler, A.R.I.B.A., Cornwallis-street.

SEPTEMBER 8.—**Bradshaw Mills.**—CONVENIENCES, ETC.—Tenders are invited for the erection of two blocks of conveniences, and re-arrangement of sanitary tower at Bradshaw Mills, near Halifax. Plans, etc., may be seen, and bills of quantities obtained, at the offices of Messrs. Clement Williams & Sons, architects, Post-office-buildings, Commercial-street, Halifax.

SEPTEMBER 8.—**Llandrindod Wells.**—CHURCH EXTENSIONS.—Estimates are invited by the Rector and Churchwardens for extensions to Holy Trinity Church, Llandrindod Wells. Plans, etc., may be seen, and bills of quantities obtained, at the offices of Mr. R. Wellings Thomas, F.R.I.B.A., architect, Llandrindod Wells.

SEPTEMBER 8.—**Millshaw.**—ALTERATIONS, ETC.—Tenders wanted for the various works required in the alterations and additions to three cottages, Millshaw, Churwell, for Messrs. W. L. Ingle, Ltd. Plans, etc., may be seen, and quantities obtained, at the offices of Mr. T. A. Buttery, F.I.A.S., architect, Queen-street, Morley, and 1, Basinghall-square, Leeds.

SEPTEMBER 8.—**Nottingham.**—ALTERATIONS.—Nottingham Education Committee invite tenders for alterations, etc., at the Berridge-road Council Schools. Plans may be seen at, and specifications, etc., obtained from, the office of the City Architect, Mr. Frank B. Lewis, Guildhall, on payment of a deposit of 1*l*. 1s.

SEPTEMBER 8.—**Sampford Peverell.**—SCHOOL ENLARGEMENT.—Tenders are invited for the enlargement of Sampford Peverell Schools. Plans and specification to be seen at the offices of Messrs. E. H. Harbottle & Son, architects, County-chambers, Exeter.

SEPTEMBER 8.—**Smithfield, Drainie.**—REPAIRS.—Tenders are wanted for restoring farm buildings at Smithfield, Drainie. Plans, etc., may be seen with Mr. John Wittet, architect, Elgin.

SEPTEMBER 9. — **Abbotshill.**—RESIDENCE.—For the erection of a new residence at Abbotshill, Seaford, near Torrington. Names to Mr. Harbottle Reed, F.R.I.B.A., architect, 12, Castle-street, Exeter.

SEPTEMBER 9. — **Bingley.** — WEAVING SHED AND WAREHOUSE.—Tenders are invited for the various works required in the erection of a weaving shed and warehouse for Mr. B. Foulds. Plans may be seen, and quantities obtained, at office of Mr. Wm. Rhodes Nunns, M.S.A., architect and engineer, Bank-chambers, Bingley.

SEPTEMBER 9. — **Elgin.** — LAUNDRY.—Tenders are wanted for the various works required in the erection of new buildings for the Elgin Laundry Company, Ltd. Plans and specifications may be seen with Mr. John Wittet, architect, Elgin.

SEPTEMBER 10.—**Blackwood, Mon.**—HOUSES.—Tenders are invited for the erection of fourteen (or more) houses at Blackwood, Mon., for Messrs. the Glen View Building Club. Plans and specifications can be seen, and form of tender obtained, at the office of Mr. D. J. Thomas, architect, High-street, Blackwood, Mon.

SEPTEMBER 11.—**Dorchester.**—SCHOOL.—Dorset C.C. Education Committee invite tenders for the erection of a new school in Victoria Park, Dorchester. Plans and specification may be seen at the County Education Office, Dorchester.

SEPTEMBER 13.—**Blackrock.**—HOUSES.—Tenders are invited for the erection of three dwelling-houses, Blackrock, for Mr. T. O'Reilly. Plans, etc., may be seen at the offices of Messrs. W. H. Hill & Son, architects, 28, South-mall, Cork.

SEPTEMBER 13.—**Broomhill.**—ADDITIONS, ETC.—Tenders are invited for proposed additions and alterations to Manager's house, for the Togston-terrace Co-operative Society, Broomhill. Plans and specifications can be seen at the stores.

* SEPTEMBER 13. — **Doncaster.** — SCHOOL. — The Governors of the Doncaster Municipal High School for Girls invite tenders for school. See advertisement in this issue for further particulars.

SEPTEMBER 14.—**Stretford.**—COTTAGES.—The Stretford U.D.C. invite tenders for the erection of an additional eleven pairs of semi-detached cottages in Lacy-street, Stretford. Plans, etc., may be seen, and bills of quantities obtained, at the offices of the architects, Messrs. John Bowden & Co., 14, Ridgefield, Manchester, upon payment of 1*l*.

* SEPTEMBER 14. — **Teignmouth.** — SCHOOL.—The Devon County Education Authority invite tenders for new Council School at Exeter-road, Teignmouth. See advertisement in this issue for further particulars.

SEPTEMBER 15.—**Bargoed.**—COTTAGES.—Tenders are invited for the erection of twenty-eight cottages at Bargoed for the Bargoed Building Club. Plans and specifications can be seen, and particulars obtained, at the office of Mr. Idris Leyshon, architect and surveyor, Hanbury-road, Bargoed.

SEPTEMBER 15. — **Newcastle-on-Tyne.**—RAILWAY OFFICES.—The Directors of the North-Eastern Railway Company invite tenders for the erection of a block of offices in Westgate-road, Newcastle-on-Tyne. Plans and specification may be seen, and quantities and further information obtained, upon application to Mr. William Bell, the Company's Architect, Central Station, Newcastle-on-Tyne.

SEPTEMBER 16.—**Abertillery.**—SCHOOL EXTENSION.—The Abertillery U.D.C. Education Committee invite tenders for the extension of the Abertillery Central Girls' School. Drawings and specifications may be inspected at the office of the architect, Mr. W. H. Hiley, Chapel-street, Abertillery, who will supply bills of quantities on deposit of 1*l*. 1s.

SEPTEMBER 17.—**Swinton.**—SCHOOL ADDITIONS.—The West Riding Education Committee invite whole or separate tenders for making additions and alterations to the Kilnhurst Provided School, Swinton. Plans may be seen, and specifications with quantities obtained, on application to the West Riding Architect, County Hall, Wakefield, on deposit of 1*l*. in each case by separate letter to the West Riding Treasurer, County Hall, Wakefield.

* SEPTEMBER 18. — **Cardiff.** — COUNTY HALL.—The Glamorgan C.C. invite tenders for a County Hall in Cathays Park, Cardiff. See advertisement in this issue for further particulars

SEPTEMBER 20.—**Cambridge.**—ADDITIONS TO PUMPING STATION.—Erection of additions to the Sewage Pumping Station, Riverside, Cambridge, according to plans, etc., prepared by the Borough Surveyor. A copy of the plans, etc., may be seen at the office of the Borough Surveyor, Guildhall.

SEPTEMBER 20.—**Henley-on-Thames.**—PUMPING STATION EXTENSIONS. — The Henley-on-Thames Corporation invite tenders for additions and alterations to the engine and boiler house at the Lambridge Power Station, including boiler and engine foundations and setting for economiser. Plans, etc., and form of tender may be obtained at the office of the Borough Surveyor, Mr. E. F. Pratt, at Henley.

SEPTEMBER 20.—**Holy Island, Northumberland.**—LIFEBOAT HOUSE AND SLIP. — The Committee of Management of the Royal National Lifeboat Institution invite tenders for the construction of a timber and corrugated steel lifeboat house and timber slip at "The Snook," Holy Island, Northumberland. Plans and specification may be inspected on application to the Local Honorary Secretary, the Rev. Irvine Crawshaw, M.A., the Vicarage, Holy Island, Beal, or at the office of the Engineer and Architect to the Royal National Lifeboat Institution, Mr. W. T. Douglass, M.Inst.C.E., 15, Victoria-street, Westminster, London, S.W., on or after September 4. Copies of the bill of quantities and form of tender may be obtained on application to the Engineer and Architect, accompanied by a deposit of 1*l*., and also of certain of the plans on payment of 3s. (not returnable).

SEPTEMBER 20.—**Laurencekirk.**—STATION BUILDINGS.—The Directors of the Caledonian Railway Company invite tenders for the works to be executed in the construction of new station buildings at Laurencekirk. The drawings may be seen at the office of the Company's Engineer, Buchanan-street Station, Glasgow, where copies of the specification and schedule may be obtained on payment of 2*l*. 2s.

SEPTEMBER 20.—**Weardale.**—STONE BRIDGES.—The Weardale R.D.C. invite tenders for the erection of three stone bridges on the new road from Eastgate to Rookhope. Plans may be seen, and other information obtained, on application to Mr. G. W. Egglestone, the Highway Surveyor, at his office at the Board-room of the Guardians in Stanhope. Intending contractors requiring specifications and forms of tender will be required to make a deposit of 1*l*.

SEPTEMBER 21. — **Bristol.** — SCHOOL.—The Bristol Education Committee invite separate tenders for the builder's, plumber's, and electrician's work connected with the erection of a Council school at Alexandra Park, Fishponds. Drawings, etc., may be inspected, and (on payment of a deposit of 2*l*. 2s.) forms of tender and quantities may be obtained at the office of the architects, Messrs. Rodway & Dening, Gaunt House, Orchard-street, Bristol.

SEPTEMBER 21.—**Durham.**—COUNCIL SCHOOLS, ETC.—Durham C.C. invite sole tenders for new Council schools at Wingate and Cold Hesledon; alterations and additions at Dean Bank, New Penshaw, and Westwood Council Schools. Plans, etc., may be seen, and bills of quantities obtained, as follows:—(1) For Wingate School, at the office of Mr. W. Rushworth, Shire Hall, Durham. (2) For Cold Hesledon School, Mr. J. W. F. Phillipson, Murton-chambers, 8, Grainger-street, Newcastle-on-Tyne. (3) For Dean Bank School, Mr. T. W. T. Richardson, 57, High-street, Stockton-on-Tees. (4) For New Penshaw and Westwood Council Schools (plans, specifications, and general conditions only), Mr. F. E. Coates, Shire Hall, Durham.

SEPTEMBER 22.—**Ilfracombe.**—BUSINESS PREMISES.—Tenders are invited for the erection of business premises, the Promenade, Ilfracombe, for Mr. T. D. Harding. Drawings, etc., may be obtained at the office of Mr. Allen T. Hussell, F.R.I.B.A., Market-square, Ilfracombe.

* SEPTEMBER 22.—**Putney Bridge.**—ALTERATIONS.—The Fulham B.C. invite tenders for alterations to wharf and additions to wharf-keeper's house at Swan Wharf, Putney Bridge. See advertisement in this issue for further particulars.

BUILDING—*continued.*

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

✱ SEPTEMBER 23.—**Maidstone.**—ISOLATION HOSPITAL.—The Maidstone R.D.C. invite tenders for Isolation Hospital at Loose, near Maidstone. See advertisement in this issue for further particulars.

✱ SEPTEMBER 23.—**Tunbridge Wells.**—POST-OFFICE EXTENSIONS.—The Commissioners invite tenders for extension of the Tunbridge Wells Post-office. See advertisement in this issue for further particulars.

NO DATE. — **Accrington.**—ALTERATIONS.—Tenders are invited for the work required in the alterations to the Crown Inn, Whalley-road, Accrington, belonging to Messrs. J. Grimshaw, Ltd. Plans can be seen, and quantities obtained, on payment of a deposit of 1*l.*, from Messrs. Bell & Eastham, surveyors, 18, Bank-street, Accrington.

NO DATE.—**Belfast.**—VILLA.—Tenders are invited for the erection of villa residence, Upper Newtownards-road, Belfast, for Mr. John O'Neill. Plans, etc., can be obtained at the office of Messrs. Moore & Flanigan, architects, 35, Royal-avenue, Belfast.

NO DATE.—**Bradford Moor.**—STABLING.—Tenders are required for the erection of a block of stabling at Bradford Moor. Quantities will be forwarded on written application to Messrs. James Young & Co., architects and surveyors, 62, Market-street, Bradford.

NO DATE.—**Brynherbert.**—IMPROVEMENTS AND REPAIRS.—The Cardigan County Education Committee invite estimates for carying out improvements and repairs to Brynherbert Council School. Plans, etc., can be seen, and full particulars obtained from Mr. James James, Ffynonhywel Llanrhystyd, or from the office of Mr. Geo. Dickens-Lewis, County Architect, Aberystwyth.

NO DATE. — **Harestock.**—COTTAGES.—Tenders are invited for the erection of six cottages at Harestock, near Winchester. Plans and specification can be obtained on application to the architects, Messrs. Meakin, Archer, & Stoneham, 32, Nicholas-lane, London, E.C.

NO DATE.—**Wheatley Hill.**—MINERS' HALL.—Tenders are invited for the erection and completion of a miners' hall at Wheatley Hill. Plans, etc., may be seen, and quantities obtained, on application to the architect, Mr. James Garry, F.R.I.B.A., 47, Church-street, West Hartlepool.

✱ NO DATE. — **Wolverhampton.** — SCHOOL.—The Wolverhampton Education Authority invite tenders for school for 400 scholars. See advertisement in this issue for further particulars.

ENGINEERING, IRON, AND STEEL.

SEPTEMBER 20.—**Pontllanfraith.**—BRIDGE WORKS.—Monmouth Main Roads and Bridges Committee invite tenders for the pulling down of the existing bridge at Pontllanfraith and the erection of a steel structure. Plans, etc., may be seen at the office of Mr. William Tanner, F.S.I., County Surveyor, and a copy of the quantities obtained on payment of 1*l.* 1s.

SEPTEMBER 21.—**Bristol.**—HEATING AND VENTILATING.—The Bristol Education Committee invite tenders for the heating and ventilating of the Council school to be erected at Alexandra Park, Fishponds. General conditions, etc., and the drawings may be inspected, and (on payment of a deposit of 1*l.* 1s.) specification, etc., may be obtained at the office of the architects, Messrs. Rodway & Dening, Gaunt House, Orchard-street, Bristol.

MISCELLANEOUS.

SEPTEMBER 6. — **London.** — RAILWAY STORES. — The Directors of the Bengal and North-Western Railway Company, Ltd., invite tenders for the supply and delivery of various stores, as per specification to be seen at the company's offices, 237, Gresham House, Old Broad-street, London, E.C. For each specification a charge of 10s. will be made.

SEPTEMBER 6. — **Smallthorne.** — SCAVENGING.—The Smallthorne U.D.C. invite tenders for scavenging in the Packmoor and Bradeley areas of the Urban District. Particulars and a form of contract may be seen on application to Mr. E. Dutton, Sanitary Inspector, or to Mr. Geo. Phillips, Clerk to the Council, Council Offices, Smallthorne.

SEPTEMBER 11.—**Manchester.**—CREOSOTING PLANT.—Manchester Corporation Waterworks Committee invite tenders for the supply of a creosoting plant to be erected on their Thirlmere Estate. Specification and form of tender may be obtained on application to the Secretary, Waterworks Offices, Town Hall, Manchester, on payment of 1*l.* 1s.

SEPTEMBER 14. — **Blaydon.** — SCAVENGING, ETC.—The Blaydon U.D.C. invite tenders for the removal and disposal of contents of ashpits, etc., at Victoria Garesfield. Full particulars may be obtained from Mr. Robert Biggins, Sanitary Inspector, at the offices of the Council, Blaydon-on-Tyne, between 9 and 10 a.m.

SEPTEMBER 14. — **Heywood.** — GAS FITTINGS, ETC.—The Gas Committee invite tenders for the supply of tubes and fittings, sulphuric acid, and tinned goods. Specification and form of tender may be obtained upon application to Mr. W. Whatmough, Gas Manager, Municipal Buildings, Heywood.

SEPTEMBER 14.—**Southampton.**—PULLING DOWN.—Southampton Corporation invite tenders for pulling down certain premises in Evans-street and removing the materials. Specification, etc., may be inspected, and form of tender obtained, at the Borough Engineer's Office.

SEPTEMBER 16. — **Haverfordwest.** — FIRE BRIGADE SUPPLIES.—The Haverfordwest Corporation Fire Brigade Committee invite tenders for leather hose, canvas hose, gun-metal breeching, etc. Further particulars may be obtained from Mr. W. Bevan, Borough Surveyor, Council Chambers, Haverfordwest.

SEPTEMBER 16.—**Newbury.**—FENCING.—Tenders are invited from local builders and ironmongers for the provision and fixing of about 700 yds. of fencing and entrance gates for the new cemetery. Specifications, etc., may be seen at office of Mr. S. J. L. Vincent, A.M.Inst.C.E., Borough Surveyor, Mansion House-street.

✱ SEPTEMBER 17.—**Taunton.**—WATER METERS.—The Taunton R.D.C. invite tenders for supply of forty meters. See advertisement in this issue for further particulars.

SEPTEMBER 25.—**Braintree.**—CAST-IRON PIPES, ETC.—Braintree R.D.C. invite tenders for the supply and delivery at Kelveden (G.E.R.) of about 550 tons of 7-in., 6-in., 5-in., 4-in., and 3-in. cast-iron pipes, well cylinders, specials, and other works. Specification, etc., may be obtained from the engineers, Messrs. Sands & Walker, Milton-chambers, Nottingham, on payment of 3*l.* 3s.

PAINTING, etc.

SEPTEMBER 6. — **Bradford.** — PAINTING.—The Bradford Education Committee invite tenders for the outside painting of several schools and the inside painting of two school-houses. Specification and form of tender may be obtained at the office of the City Architect, Whitaker-buildings, Brewery-street, Bradford.

SEPTEMBER 7.—**Oldham.**—PAINTING, ETC.—The Park and Cemeteries Committee of the Oldham Corporation invite tenders for painting, etc., at Holkinwood Cemetery. Specification and form of tender may be obtained at the office of the Borough Surveyor.

SEPTEMBER 8. — **Crumpsall.**—PAINTING.—The Manchester Guardians invite tenders for painting the exterior of the Workhouse Infirmary at Crumpsall. Specifications may be obtained from the office of Mr. A. J. Murgatroyd, architect, 23, Strutt-street, Manchester, upon payment of a deposit of 10s. 6d.

SEPTEMBER 9.—**Leeds.**—PAINTING.—Tenders are invited for the painting work required at the Holbeck, Headingley, and Armley Branch Libraries. Specifications may be seen, and forms of tender, etc., obtained, at office of Mr. W. T. Lancashire, City Engineer, Municipal Buildings, Leeds.

SEPTEMBER 11. — **Belfast.** — PAINTING.—The Tramways and Electricity Committee of the Belfast Corporation invite tenders for the painting, etc., of the Electric Supply Station, East Bridge End. Specification (No. 1. 8), with form of tender, etc., may be obtained from Mr. Thomas W. Bloxam, M.Inst.E.E., City Electrical Engineer, Corporation Electricity Works, East Bridge-street, Belfast, on deposit of 1*l.* 1s.

✱ SEPTEMBER 13.—**London, W.**—JOBBING WORK.—The Managers of the Central London Sick Asylum District invite tenders for jobbing work. See advertisement in this issue for further particulars.

SEPTEMBER 14. — **Birmingham.** — PAINTING AND CLEANING. — Birmingham Parish Guardians invite tenders for cleaning and painting the exterior woodwork and ironwork, etc., of the Parish Offices, Edmund-street, Birmingham. Specification can be seen, and particulars obtained from the architects, W. H. Ward, Paradise-street, Birmingham.

SEPTEMBER 14. — **Eastby.** — PAINTING.—Bradford Guardians invite tenders for painting the Sanatorium at Eastby, near Skipton, also Union Offices, 22, Manor-row, Bradford. Specifications and forms of tenders may be obtained (on receipt of 1*l.* 1s. deposit) at the Architect's office, 22, Manor-row, Bradford.

SEPTEMBER 20. — **Halifax.**—PAINTING.—The Health Committee of the Halifax Corporation invite tenders for the outside painting of three houses, and the inside and outside painting of sheds, stables, and mortuary, situate at the Scavenging Depôt, Listerlane and Hall-street. Plans, etc., may be seen, and forms of tender obtained, on application to Mr. James Lord, M.Inst.C.E., Borough Engineer, Town Hall, Halifax, upon payment of the sum of 1*l.*

✱ SEPTEMBER 22. — **London, W.**—DECORATIONS AND REPAIRS.—The Fulham B.C. invite tenders for certain decorations and repairs to underground convenience at Gibbs-green, West Kensington, and the urinal at Putney Bridge. See advertisement in this issue for further particulars.

ROADS, SANITARY, AND WATER WORKS.

SEPTEMBER 6.—**Altrincham.**—SEWERS.—Altrincham U.D.C. invite tenders for the construction of 9-in., 12-in., and 15-in. sewers in Regent-road and Oldfield-road, together with manholes, etc. Plans and specifications may be seen, and quantities and forms of tender obtained, on application to Mr. H. E. Brown, Surveyor to the Council, Town Hall, Altrincham.

SEPTEMBER 6.—**Burnage.**—MAKING-UP.—Manchester Corporation (Withington Committee) invite tenders for the making-up (with natural rock asphalt) of Burnage Hall-road, Burnage. Plans, etc., can be seen, and a form of tender with quantities and any further information obtained from the Surveyor to the Committee, Town Hall, West Didsbury.

SEPTEMBER 6. — **West Moor.** — STREET WORKS.—Tynemouth R.D.C. invite tenders for the construction of carriageways, etc., in Ash-terrace, Maple-street, etc., West Moor. Plans, etc., may be seen at the office of Mr. A. S. Dinning, 21, Ellison-place, Newcastle.

SEPTEMBER 7.—**Bedford.**—ROAD-MAKING AND PAVING.—Bedford T.C. invite tenders for paving and road-making in Sidney-road, Bedford, according to plans, etc., which, with the form of contract, may be seen, and any other information obtained, at the Borough Surveyor's Office, Town Hall, Bedford.

SEPTEMBER 7.—**Deptford.**—PIPE SEWER.—Deptford B.C. invite tenders for the construction of pipe sewer at Brockley-road. Form of tender and all other information can be obtained on application during office hours at the office of the Borough Surveyor, Mr. J. Sutcliffe, A.M.Inst.C.E., Town Hall, New Cross-road, S.E.

SEPTEMBER 7. — **Leigh-on-Sea.** — FLAGGING.—The Leigh-on-Sea U.D.C. invite tenders for the works required to be done in taking-up tar paving and flagging with concrete flags in Cliff-parade, in accordance with plans and specifications prepared by the Surveyor to the Council, Mr John Wm. Liversedge, A.M.Inst.C.E., from whom forms of tender and quantities can be obtained on depositing the sum of 10s. 6d.

SEPTEMBER 8. — **Barrow-in-Furness.** — STREET WORKS.—The Corporation invite tenders for the construction of certain lengths of streets. Plans may be seen, and bills of quantities, etc., obtained, upon application at the Borough Engineer's Office, Town Hall.

SEPTEMBER 9. — **Edinburgh.**—SEWER.—Edinburgh Council invite offers for the construction of a new 4-ft. diameter sewer for the Haymarket District, to conform to plans, etc., prepared by the Burgh Engineer, from whom all schedules of measurement and all particulars may be obtained.

SEPTEMBER 9. — **Gowerton.** — GAS PIPES. — The Directors of the Gowerton and District Gas Company, Ltd., invite tenders for the supplying, laying, jointing, and reinstating pipes in the Gowerton District. Specification and schedule may be obtained at the offices of the company upon the receipt of 2*l.* 2s. Mr. Rex Vivian, Secretary, Gasworks, Gowerton.

SEPTEMBER 9. — **Hackney.** — ROAD-MAKING, ETC.—Hackney B.C. invite tenders for the kerbing, channelling, paving, making-up, etc., of Leabourne-road (northern portion). Specification, plans, etc., may be inspected, and copies of the bill of quantities and form of tender obtained, on application to Mr. Norman Scorgie, M.Inst.C.E., Borough Engineer and Surveyor, and on payment of the sum of 1*l.* 1s.

SEPTEMBER 9.—**Knebworth.**—SEWERAGE: CONTRACT No. 2.—Tenders are invited for the construction of about 3,250 lin. yds. stoneware pipes, and about 60 lin. yds. of cast-iron pipes, with manholes, screening chamber, etc., on the Knebworth Building Estate. Drawings and specification may be seen, and bills of quantities obtained, on application to Mr. R. C. F. Busfeild, Resident Engineer, Knebworth Station, by deposit of cheque for 5*l.* 5s.

SEPTEMBER 13. — **Church.** — MAIN SEWER.—Church U.D.C. invite tenders for the construction of a main sewer from Fox-street to the Outfall Sewerage Works at Coppy Clough, Church. Plans may be seen, and forms of tender, etc., obtained, on application to Mr. W. E. Wood, Surveyor, D.C. Offices, Church.

SEPTEMBER 13. — **Runcorn.** — STREET WORKS.—The R.D.C. of Runcorn invite tenders from specialists in tar macadam for the making of Victoria-road, Grappenhall. Plans, etc., may be seen, and quantities obtained (on deposit of 10s. 6d.), at Mr. Robert Garnett's, Sankey-street, Warrington.

SEPTEMBER 14. — **Lewisham.** — STREET WORKS.—The Lewisham B.C. invite tenders for kerbing, channelling, and metalling the roadways, and paving the footpaths with artificial stone (in separate contracts) of Wearside-road, Lewisham. Plans, etc., may be seen, and forms of tender obtained, at the Town Hall, Catford (Surveyor's Department), on and after Wednesday, September 1, 1909. Copies of the specification, etc., may be had on payment of 5s. in each case, which will not be returned.

SEPTEMBER 14. — **New Malden.** — STONEWARE PIPE SEWER.—The Maldens and Coombe U.D.C. invite tenders for the reconstruction of a 9-in. stoneware pipe sewer, together with all manholes and connexions, between Queen's-road and Albert-road, New Malden. Drawings may be seen, and specifications, etc., obtained, on application to the Engineer and Surveyor, Mr. Reginald H. Jeffes, A.M.Inst.C.E., at the Council Offices, New Malden, between the hours of 10 and 5, upon payment of a deposit of 2*l.* 2s.

SEPTEMBER 15. — **Hornsey.** — ROAD WORKS.—The Hornsey T.C. invite tenders for sewering and making-up various streets situate within the Borough. Forms of tender, etc., and all information can be obtained from Mr. E. J. Lovegrove, Borough Engineer and Surveyor, Municipal Offices, 99, Southwood-lane, Highgate.

SEPTEMBER 16. — **Croydon.** — EARTHENWARE PIPE SEWERS.—The Croydon R.D.C. invite tenders for the construction of about 3,000 ft. lineal of earthenware pipe sewer, with manholes, etc., in Manor-road, Wallington. Plans and specification may be seen on and after September 6, at the office of the Council's Highway Surveyor, Mr. J. S. Killock, A.M.Inst.C.E., Katharine-street, Croydon, and form of tender, with copy of the bill of quantities, obtained on payment of 2*l.* 2s.

SEPTEMBER 16.—**Croydon.**—PRIVATE STREET WORKS.—Croydon R.D.C. invite tenders for the execution of private street works in the following roads:—Parish of Coulsdon—Cross-road, Foxley-gardens, Hillside-avenue, Purley-vale, Silverdale-road, Sunnydene-road. Plans, etc., prepared by the Council's Surveyor, Mr. R. M. Chart, F.S.I., can be inspected, and forms of tender obtained, at his office, Katharine-street, Croydon, on payment of 2*l.* 2s.

SEPTEMBER 17.—**Barking.**—PRIVATE STREET WORKS.—The Barking Town U.D.C. invite tenders for the execution of private street works at Bifrons-street (eastern portion). Plans and sections may be seen, and specification, etc., obtained from Mr. C. F. Dawson, Surveyor to the Council, Public Offices, Barking.

✱ SEPTEMBER 20. — **Beckenham.** — ROAD-MAKING.—The Beckenham U.D.C. invite tenders for making-up Shortlands-grove and a new road between Belmont and Hampden roads. See advertisement in this issue for further particulars.

SEPTEMBER 20.—**Bermondsey.**—REPAVING.—The B.C. invite tenders for the repaving of Parish-street and portions of Great Maze Pond with creosoted wood blocks. Plans, etc., may be seen, and forms of tender obtained, on application to Mr. R. J. Angel, M.Inst.C.E., Borough Surveyor.

SEPTEMBER 25. — **Braintree.** — WATER SUPPLY.—The Braintree R.D.C. invite tenders for carrying out water supply works for the Parishes of Great Coggeshall, Little Coggeshall, and Kelvedon. Plans and specifications may be seen, and copies of the quantities and form of tender obtained from the engineers, Messrs. Sands & Walker, Milton-chambers, Nottingham, on payment of 3*l.* 3s.

✱ SEPTEMBER 28. — **Willesden.** — DRAINAGE.—The Willesden D.C. invite tenders for constructing drainage intercepting sewer. See advertisement in this issue for further particulars.

NO DATE.—**York.**—STREET IMPROVEMENTS.—Tenders are invited for the execution of certain street widenings and improvements on the Holgate and Acomb roads, including excavating, the erection of retaining walls, etc. Plans may be seen, and copy of specification, etc., obtained, on depositing 1*l.* 1s., from Mr. F. W. Spurr, City Engineer, Guildhall, **York.**

STONES, MATERIAL, AND STORES.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

SEPTEMBER 8.—**Manchester.**—TERRA-COTTA.—Manchester Education Committee invite tenders for the supply of terra-cotta for the Brookdale Park Municipal School, Newton Heath, Manchester. Plans may be seen, and a copy of the bills of quantities (including specification) may be obtained, at the offices in Deansgate, Manchester, on a deposit of cheque for 1*l.* 1s., to be made payable to the Accountant, Education Offices, Deansgate, Manchester.

SEPTEMBER 8.—**Tipton.**—COLD BLAST SLAG MEDIA.—The Tipton U.D.C. invite tenders for 20,000 cube yds. of cold blast slag media for filter beds at the Sewage Disposal Works, Toll End. Specification and all other particulars obtained, on application at the offices of Messrs. Dodd & Dodd, A.M.Inst.C.E., civil engineers, 37, Waterloo-street, Birmingham, on payment of a sum of 2*l.* 2s.

SEPTEMBER 10.—**Eastbourne.**—GRANITE SPALLS.—The Eastbourne Guardians invite tenders for the supply of 50 tons of blue Guernsey granite spalls for breaking. Forms of tender may be had on application to Mr. A. Hurst, Clerk, Guardians' Offices, Avenue House, Eastbourne.

SEPTEMBER 11.—**Rothwell.**—BROKEN GRANITE AND GRAVEL.—Rothwell U.D.C., Northants, invite tenders for the supply of 2-in. and 1½-in. broken granite (best and seconds), 2-in. and 1½-in. broken slag, 1-in. and ½-in. granite and slag chipping, ¾-in. natural gravel, at per ton. Tenders and samples to be delivered at the office of Mr. T. C. Betts, Surveyor, Market House, Rothwell, Northants.

* SEPTEMBER 14.—**Edmonton.**—PORTLAND CEMENT.—The Edmonton U.D.C. invite tenders for supply of Portland cement. See advertisement in this issue for further particulars.

SEPTEMBER 18.—**Tredegar.**—ROAD MATERIAL.—The U.D.C. of Nantyglo and Blaina invite tenders for the supply of limestone, granite, and limestone and granite chippings. Tenders to be sent to Mr. H. J. C. Shepard, Clerk, Tredegar, and samples to Mr. W. J. Davies, Blaina, the Council's Surveyor.

SEPTEMBER 20.—**Dorchester.**—ROAD MATERIAL.—Tenders are invited for supply and delivery of road material. Forms of tender, etc., may be obtained from Mr. Percival T. Harrison, A.M.Inst.C.E., Borough Engineer, Guildhall Chambers, Dorchester.

SEPTEMBER 20.—**Sunbury-on-Thames.**—BROKEN GRANITE.—Sunbury-on-Thames U.D.C. invite tenders for the supply of granite, broken to pass through a 2½-in. ring. Further particulars may be obtained of Mr. Harold F. Coales, the Surveyor to the Council, Council Offices, Sunbury-on-Thames.

Public Appointment.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*WOODWORK INSTRUCTOR	Bridewell Hospital	100*l.* per annum, etc.	Sept. 29

Auction Sale.

Nature and Place of Sale.	By whom Offered.	Date of Sale.
*DEALS, BATTENS, ETC.—Great Hall, Winchester House, Old Broad-street, E.C.	Churchill & Sim	Sept. 8

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£ s. d.	
Best Stocks	1 6	6 per 1000 alongside, in river.
Picked Stocks for Facings	2 10 0	,, delivered
Flettons.....	1 4 6	,, at railway depôt.
Best Fareham Red	3 12 0	,, ,, ,,
Best Red Pressed Ruabon Facing..	5 0 0	,, ,, ,,
Best Blue Pressed Staffordshire ...	3 15 0	,, ,, ,,
Do. Bullnose	4 0 0	,, ,, ,,
Best Stourbridge Fire Bricks	3 14 0	,, ,, ,,
GLAZED BRICKS.		
Best White and Ivory Glazed Stretchers.....	10 7 6	,, ,, ,,
Headers	9 17 6	,, ,, ,,
Quoins, Bullnose, and Flats	13 17 6	,, ,, ,,
Double Stretchers	15 17 6	,, ,, ,,
Double Headers ...	12 17 6	,, ,, ,,
One Side and two Ends	16 17 6	,, ,, ,,
Two Sides and one End.....	17 17 6	,, ,, ,,
Splays and Squints	15 7 6	,, ,, ,,
Best Dipped Salt Glazed Stretchers	10 7 6	,, ,, ,,
Headers.....	9 17 6	,, ,, ,,
Quoins, Bullnose, and Flats	13 17 6	,, ,, ,,
Double Stretchers	15 17 6	,, ,, ,,
Double Headers...	12 17 6	,, ,, ,,
One Side and two Ends	16 17 6	,, ,, ,,
Two Sides and one End.....	17 17 6	,, ,, ,,
Splays and Squints	15 7 6	,, ,, ,,
Second Quality White and Dipped Salt Glazed	1 5 0	,, less than best.

	s. d.	
Thames and Pit Sand	6 6	per yard, delivered.
Thames Ballast	5 0	,, ,,
Best Portland Cement.....	28 0	per ton, ,,
Best Ground Blue Lias Lime	19 0	,, ,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 11s. 6d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 0d. per ton at rly. dpt.

STONE.

	s. d.	
BATH STONE—delivered on road waggons, Paddington Depôt.....	1	6½ per ft. cube.
Do. do. delivered on road waggons, Nine Elms Depôt.....	1	8½ ,, ,,
PORTLAND STONE (20 ft. average)—		
Brown Whitbed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2	1 ,, ,,
White Basebed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2	2½ ,, ,,

STONE (*continued*).

	s. d.	
Ancaster in blocks	1 10	per ft. cube deld. ry dep.
Beer ,, ...	1 6	,, ,,
Greenshill ,, ...	1 10	,, ,,
Darley Dale in blocks ...	2 4	,, ,,
Red Corsehill ,, ...	2 2	,, ,,
Closeburn Red Freestone	2 0	,, ,,
Red Mansfield ,,	2 4	,, ,,

YORK STONE—*Robin Hood Quality.*

	s. d.	
Scappled random blocks.	2 10	per ft. cube, deld. rly. dep.
6 in sawn two sides landings to sizes (under 40 ft. super.)	2	3 per ft. super. ,,
6 in. rubbed two sides ditto, ditto	2	6 ,, ,,
3 in. sawn two sides slabs (random sizes)	0	11½ ,, ,,
2 in. to 2½ in. sawn one side slabs (random sizes)	0	7½ ,, ,,
1½ in. to 2 in. ditto, ditto	0	6 ,, ,,
HARD YORK—		
Scappled random blocks	3	0 per ft. cube, ,,
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2	8 per ft super. ,,
6 in. rubbed two sides ditto	3	0 ,, ,,
3 in. sawn two sides slabs (raudom sizes)	1	2 ,, ,,
2 in. self-faced random flags	0	5 ,, ,,

SLATES.

In. In.	£ s. d.	
20×10 best blue Bangor	13 2	6 per 1000 of 1200 at r.d.
20×12 ,, ,,	13 17	6 ,, ,,
20×10 first quality ,,	13 0	0 ,, ,,
20×12 ,, ,,	13 15	0 ,, ,,
16×8 ,, ,,	7 5	0 ,, ,,
22×10 best blue Portmadoc	12 12	6 ,, ,,
16×8 ,, ,,	6 12	6 ,, ,,
20×10 best Eureka unfading green ...	15 17	6 ,, ,,
20×12 ,, ,,	18 7	6 ,, ,,
18×10 ,, ,,	13 5	0 ,, ,,
16×8 ,, ,,	10 5	0 ,, ,,
20×10 permanent green	11 12	6 ,, ,,
18×10 ,, ,,	9 12	6 ,, ,,
16×8 ,, ,,	6 12	6 ,, ,,

TILES.

	s. d.	
Best plain red roofing tiles...	42	0 per 1000 at rly. dep.
Hip and Valley tiles ...	3	7 per doz. ,,
Best Broseley tiles	50	0 per 1000 ,,
Do. Ornamental tiles	52	6 ,, ,,
Hip and Valley tiles ...	4	0 per doz. ,,
Best Ruabon red, brown, or brindled do. (Edwards) ...	57	6 per 1000 ,,
Do. Ornamental do.....	60	0 ,, ,,
Hip tiles	4	0 per doz. ,,
Valley tiles	3	0 ,, ,,
Best Red or Mottled Staffordshire do. (Peakes)	51	9 per 1000 ,,
Do. Ornamental do.	54	6 ,, ,,
Hip tiles.....	4	1 per doz. ,,
Valley tiles	3	8 ,, ,,
Best "Rosemary" brand plain tiles.....	48	0 per 1000 ,,
Best Ornamental tiles.....	50	0 ,, ,,
Hip tiles.....	4	0 per doz. ,,
Valley tiles	3	8 ,, ,,

TILES (*continued*).

	s. d.	
Best "Hartshill" brand plain tiles, sand-faced.....	50	0 per 1000 at rly. dep.
Do. pressed.....	47	6 ,, ,,
Do. Ornamental do.....	50	0 ,, ,,
Hip tiles	4	0 per doz. ,,
Valley tiles	3	6 ,, ,,
Staffordshire (Hanley) Reds or Brindled tiles	42	6 per 1000 ,,
Hand-made sand-faced ...	45	0 ,, ,,
Hip tiles	4	0 per doz. ,,
Valley tiles	3	6 ,, ,,

WOOD.

BUILDING WOOD.	At per standard. £ s. d.	£ s. d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.....	13 10 0	... 15 0 0
Deals: best 3 by 9	13 0 0	... 14 0 0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11 0 0	... 12 0 0
Battens: best 2½ by 6 and 3 by 6 ...	0 10 0	less than 7 in. and 8 in.
Deals: seconds	1 0 0	less than best.
Battens: seconds	0 10 0	,,
2 in. by 4 in. and 2 in. by 6 in. ...	9 0 0	... 10 0 0
2 in. by 4½ in. and 2 in. by 5 in. ...	8 10 0	... 9 10 0
Foreign Sawn Boards— 1 in. and 1¼ in. by 7 in.	0 10 0	more than battens.
¾ in.	1 0 0	,,
Fir timber: best middling Danzig or Memel (average specification)	At per load of 50 ft. 4 10 0	... 5 0 0
Seconds	4 0 0	... 4 10 0
Small timber (8 in. to 10 in.).....	3 12 6	... 3 15 0
Small timber (6 in. to 8 in.)	3 0 0	... 3 10 0
Swedish balks	2 10 0	... 3 0 0
Pitch-pine timber (30 ft. average)	4 0 0	... 4 15 0

JOINERS' WOOD.	At per standard. £ s. d.	£ s. d.
White Sea: first yellow deals, 3 in. by 11 in.	24 0 0	... 25 0 0
3 in. by 9 in.....	22 0 0	... 23 0 0
Battens 2½ in. and 3 in. by 7 in.	16 10 0	... 18 0 0
Second yellow deals, 3 in. by 11 in.	18 10 0	... 20 0 0
3 in. by 9 in.....	17 10 0	... 19 0 0
Battens, 2½ in. and 3 in. by 7 in.	13 10 0	... 14 10 0
Third yellow deals, 3 in. by 11 in. and 9 in.	13 10 0	... 15 0 0
Battens, 2½ in. and 3 in. by 7 in.	11 0 0	... 12 0 0
Petersburg: first yellow deals, 3 in. by 11 in.....	21 0 0	... 22 10 0
Do. 3 in. by 9 in.	18 0 0	... 19 10 0
Battens	13 10 0	... 15 0 0
Second yellow deals, 3 in. by 11 in.	16 0 0	... 17 0 0
Do. 3 in. by 9 in.	14 10 0	... 16 0 0
Battens	11 0 0	... 12 10 0
Third yellow deals, 3 in. by 11 in.	13 0 0	... 14 0 0
Do. 3 in. by 9 in.	12 10 0	... 14 0 0
Battens	10 0 0	... 11 0 0
White Sea and Petersburg— First white deals, 3 in. by 11 in.	14 10 0	... 15 10 0
,, ,, 3 in. by 9 in.	13 10 0	... 14 0 0
Battens	11 0 0	... 12 0 0
Second white deals, 3 in. by 11 in.	13 10 0	... 14 10 0
,, ,, 3 in. by 9 in.	12 10 0	... 13 10 0
Battens	10 0 0	... 11 0 0
Pitch-pine: deals	18 0 0	... 21 0 0
Under 2 in. thick extra	0 10 0	... 1 0 0
Yellow pine—First, regular sizes	44 0 0	upwards.
Oddments	32 0 0	,,
Seconds, regular sizes	33 0 0	,,
Oddments	28 0 0	,,
Kauri Pine—Planks, per ft. cube...	0 3 6	... 0 5 0
Danzig and Stettin Oak logs— Large, per ft. cube	0 3 0	... 0 3
Small ,, ,, ...	0 2 6	... 0 2

WOOD (*continued*).

JOINERS' WOOD (*continued*)—	At per standard. £ s. d.	£ s. d.
Wainscot Oak Logs, per ft. cube	0 5 6	0 6 0
Dry Wainscot Oak, per ft. sup. as inch	0 0 8½	0 0 9½
¼ in. do. do	0 0 7	—
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0 0 9	0 1 0
Selected, Figury, per ft. super. as inch	0 1 6	0 2 6
Dry Walnut, American, per ft. super. as inch	0 0 10	0 1 0
Teak per load	17 0 0	22 0 0
American Whitewood Planks, per ft. cube	0 4 0	0 5 0
Prepared Flooring, etc.—	Per square.	
1 in. by 7 in. yellow, planed and shot	0 13 6	0 17 0
1 in. by 7 in. yellow, planed and matched	0 14 0	0 18 0
1¼ in. by 7 in. yellow, planed and matched	0 16 0	1 0 0
1 in. by 7 in. white, planed and shot	0 12 0	0 14 6
1 in. by 7 in. white, planed and matched	0 12 6	0 15 6
1¼ in. by 7 in. white, planed and matched	0 15 0	0 16 6
¼ in. by 7 in. yellow matched and beaded or V-jointed brds.	0 11 0	0 13 6
1 in. by 7 in. " "	0 14 0	0 18 0
¼ in. by 7 in. white " "	0 10 0	0 11 6
1 in. by 7 in. " "	0 12 9	0 15 0

6 in. at 6d. to 9d. per square less than 7 in.

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £ s. d.	£ s. d.
Rolled Steel Joists, ordinary sections	7 0 0	7 10 0
Compound Girders, ordinary sections	9 0 0	10 0 0
Steel Compound Stanchions	11 0 0	12 0 0
Angles, Tees, and Channels, ordinary sections	9 0 0	10 0 0
Flitch Plates	9 0 0	9 10 0
Cast Iron Columns and Stanchions including ordinary patterns	7 10 0	8 10 0

METALS.

	Per ton, in London. £ s. d.	£ s. d.
IRON—		
Common Bars	8 10 0	9 0 0
Staffordshire Crown Bars, good merchant quality	8 15 0	9 5 0
Staffordshire "Marked Bars"	10 10 0	—
Mild Steel Bars	8 15 0	9 5 0
Hoop Iron, basis price	9 5 0	9 10 0
" " Galvanised	17 0 0	—
("And upwards, according to size and gauge.)		
Sheet Iron, Black—		
Ordinary sizes to 20 g.	9 15 0	—
" " 24 g.	10 15 0	—
" " 26 g.	12 5 0	—
Sheet Iron, Galvanised, flat, ordinary quality—		
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	15 0 0	—
Ordinary sizes to 22 g. and 24 g.	15 10 0	—
" " 18 g.	16 10 0	—
Sheet Iron, Galvanised, flat, best quality—		
Ordinary sizes to 20 g.	18 0 0	—
" " 22 g. and 24 g.	18 10 0	—
" " 26 g.	20 0 0	—
Galvanised Corrugated Sheets—		
Ordinary sizes, 6 ft. to 8 ft. 20 g.	14 10 0	—
" " 22 g. and 24 g.	14 15 0	—
" " 26 g.	16 5 0	—
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. to 20 g. and thicker	12 0 0	—
Best Soft Steel Sheets, 22 g. & 24 g.	13 0 0	—
" " " 26 g.	15 0 0	—
Cut Nails, 3 in. to 6 in.	10 10 0	11 0 0
(Under 3 in., usual trade extras.)		

LEAD, &c. Per ton, in London.	£ s. d.	
LEAD—Sheet, English, 3lb. and up.	16 0 0	—
Pipe in coils	16 10 0	—
Soil pipe	18 10 0	—
Compo pipe	19 10 0	—
ZINC—Sheet—		
Vielle Montagne	26 10 0	—
Silesian	26 5 0	—
COPPER—		
Strong sheet per lb.	0 1 0	—
Thin "	0 1 1	—
Copper nails "	0 0 10	—
Copper wire "	0 0 10	—
BRASS—		
Strong Sheet "	0 0 11	—
Thin "	0 1 0	—
TIN—English Ingots "	0 1 5	—
SOLDER—Plumbers' "	0 0 7	—
Tinmen's "	0 0 9½	—
Blowpipe "	0 1 0	—

ENGLISH SHEET GLASS IN CRATES OF STOCK SIZES.

15 oz. thirds	2½d. per ft. delivered.
" fourths	1½d. " "
21 oz. thirds	3d. " "
" fourths	2½d. " "
26 oz. thirds	4d. " "
" fourths	3d. " "
32 oz. thirds	4½d " "
" fourths	4½d. " "
Flute Sheet, 15 oz	3½d. " "
" 21 oz.	4½d. " "

ENGLISH ROLLED PLATE IN CRATES OF STOCK SIZES.

⅛ Hartley's	2½d. per ft. delivered.
¼ "	2½d. " "
⅜ "	2½d. " "
Figured, Oxford Rolled and "Oceanic" Glass, white	3½d. " "
" " tinted	5d. " "

OILS, &c.

		£ s. d.
Raw Linseed Oil in pipes	per gallon	0 2 2
" " in barrels	"	0 2 3
" " in drums	"	0 2 6
Boiled " in barrels	"	0 2 6
" " in drums	"	0 2 9
Turpentine in barrels	"	0 3 1
" in drums	"	0 3 3
Genuine Ground English White Lead	per ton	20 10 0
Red Lead, Dry	"	20 0 0
Best Linseed Oil Putty	per cwt.	0 7 0
Stockholm Tar	per barrel	1 12 0

VARNISHES, &c.

	Per gallon. £ s. d.
Fine Pale Oak Varnish	0 8 0
Pale Copal Oak	0 10 6
Superfine Pale Elastic Oak	0 12 6
Fine Extra Hard Church Oak	0 10 0
Superfine Hard-drying Oak, for seats of Churches	0 14 6
Fine Elastic Carriage	0 12 0
Superfine Pale Elastic Carriage	0 16 0
Fine Pale Maple	0 10 0
Finest Pale Durable Copal	0 18 0
Extra Pale French Oil	1 1 0
Eggshell Flating Varnish	0 18 0
White Pale Enamel	1 4 0
Extra Pale Paper	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 0
Berlin Black	0 16 0
Knotting	0 10 9
French and Brush Polish	0 10 6

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursday*. [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is stated, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

*** Denotes *accepted*. † Denotes *provisionally accepted*.**

ABERTRIDWR.—For street works, Ilan-road, for Caerphilly Urban District Council. Mr. A. O. Harpur, Surveyor, Council Offices, Caerphilly:—

Packer Bros.	£994 18 8	J. Thomas	£761 1 0
T. Williams & Co.	832 17 7	A. J. Rossiter	750 15 2
J. Morgan	827 16 0	Morgan Bros., Penyrheol, Cardiff*	734 11 4
J. Williams	783 6 4	W. Brown	675 9 7
J. Williams & Co.	775 3 7		
A. J. Collins & Co.	763 6 5		

ABERTRIDWR.—For street works, part of Caerphilly-road and part of High-street, for Caerphilly Urban District Council. Mr. A. O. Harpur, Surveyor, Council Offices, Caerphilly:—

J. Morgan	£713 5 4	A. G. Collins & Co.	£635 0 6
J. Williams	678 6 9	Packer Bros.	633 9 0
Morgan Bros.	660 7 6	A. J. Rossiter, Caerphilly*	597 9 6
J. Williams & Co.	654 2 8	W. Brown	536 14 11
J. Thomas	650 9 5		

ARDLEIGH.—For alterations and additions at Ardleigh. Mr. H. Steward-Watling, F.S.A., architect, 153A, High-street, Colchester, etc.:—

Pyke* £140

[Gates, fencing, etc., at per schedule.]

BANBURY.—For Council School, Grimsbury, Banbury, for the Banbury Education Committee. Messrs. Talbot-Brown & Fisher, FF.R.I.B.A., architects, Wellingborough. Quantities by Messrs. Batstone Bros., Cannon-street, London:—

Williams & Carnall	£9,200 4 9	E. J. Johnson & Son	£6,947 0 0
H. Crusa	8,225 0 0	F. H. Smith	6,820 0 0
G. Orchard & Son	7,323 0 0	T. Hickman	6,747 0 0
R. Cosford	7,298 0 0	Hacksley Bros.	6,699 0 0
C. Hope	7,289 0 0	J. S. Kimbarlay	6,627 0 0
T. Simms & Son	7,030 0 0	Goodman & Murkett	6,600 0 0
J. F. Booth & Son	7,000 0 0	R. Marriott	6,582 0 0
T. H. Kingerlee & Sons	6,987 0 0	G. Henson & Son	6,464 0 0
Beardsmore & West	6,974 0 0	T. Higgs, Northampton*	6,098 0 0

BARNET (Herts).—For converting earth closets into water closets, for the Governors of Queen Elizabeth's Grammar School for Boys. Mr. J. Ladds, architect, 93, Pemberton-road, Harringay, N.:—

	Cost of complete work.	Extra cost of 500-gal. tank.
G. Jennings & Co.	£180 0 0	£22 7 6
R. Goodman & Son	165 0 0	8 0 0
Pearson & Sons	163 15 6	3 10 0
Johnson & Co.	162 0 0	16 10 0
E. Young	160 12 0	—
Dean & Perkins	160 0 0	15 0 0
E. Frost	157 4 3	8 7 9
J. T. Randall	151 19 2	5 0 0
L. Lown & Co.	150 0 0	7 0 0
W. M. Butcher	149 0 0	9 5 0
W. Pavey & Sons	145 0 0	6 0 0
W. T. Briers	140 0 0	5 10 0
G. W. Matthews	131 2 0	4 10 0
E. G. Brown	127 18 6	13 5 0
W. Anderton	126 15 3	11 10 6
W. L. Watling	126 0 0	6 11 6
A. G. Chamberlain	125 0 0	6 0 0
J. Baughen	125 0 0	3 0 0
R. Brown Bros.	124 0 0	4 10 0
H. Barrows	116 0 0	—
McLaughlin, 13, Brecknock-road, London*	109 0 0	10 0 0
T. Story & Son	95 0 0	10 5 0

BECCLES.—For the erection of two detached houses, Grange Estate, Beccles. Mr. H. Steward-Watling, F.S.A., architect, Ipswich, Lowestoft, etc.:—

H. Hindes, at per schedule.

BLUNDESTON.—For erecting a Wesleyan Chapel, near Lowestoft, for Wesleyan Trustees. Mr. R. Scott Cockrill, A.R.I.B.A., Crossley House, London-road, Lowestoft. Quantities by architect:—

Spencer, Santo, & Co., Ltd.	£1,000 0 0	Moore & Sons	£811 0 0
C. Roper	948 0 0	Hawes & Son	794 0 0
C. R. Cole	936 0 0	J. Balls	776 12 0
R. C. Todd	920 0 0	T. H. Yelf	775 0 0
W. Wynes	875 6 3	B. G. Beech	765 0 0
Carter & Wright	849 0 0	A. G. Beckett, Oulton Broad*	757 12 6
W. J. Croft	847 10 0	H. Pearman	750 0 0
F. Button & Son	825 10 0		

BOVEY TRACEY.—For additions to Riley Farmhouse, Hennock, for Mr. J. Bawdon, and for farmhouse, Mr. S. Segar, architect, 24 and 26, Union-street, Newton Abbot:—

Farmhouse, Bovey Tracey (for Messrs. Daniel Wrayford & F. Amery).

J. Winsor	£594 15	F. J. Badcock, Ashburton*	£521 0
Wills Bros. & B. Parker	585 0		

Alterations at Riley Farm, Hennock.

Wills Bros. & B. Parker	£138 0	F. J. Badcock, Ashburton*	£117 10
J. Winsor	135 0		

CARLTON COLVILLE.—For the erection of a detached bungalow, Cotmer Estate. Mr. H. Steward-Watling, F.S.A., architect, Lowestoft, and at Elmhurst, Oulton Broad:—

King	£300	Youngs*	£250
Watkins	260		

CLENCHWARTON (Norfolk).—For erection of bullock-shelters and fencing, for Mr. Hugh Kerkham. Messrs. Walker & Walker, architects, 2, Lower Hill-street, Wisbech:—

Johnson & Son	£155 5	Tash & Langley	£150 0
F. S Flood	155 0	G. Hornigold, Terrington, Lynn*	135 10
J. Medwell	155 0		

DARLINGTON.—For erecting a villa in Cleveland-avenue. Messrs. J. P. Pritchett & Son, architects, 24 High-row, Darlington. Quantities by architects:—

Brick and Plasterer's and Joiner's Works: J. Johnson, Cleveland-terrace, Darlington‡	£645 7 2
Slating and Tiling: Lancaster Bros., Chesnut-street, Darlington	90 4 10
Plumber's Work: E. Smith, Blackwellgate, Darlington	100 5 0
Painting: W. Hoskins & Co., Ianson-square, Darlington	17 7 0
Electric Lighting and Bells: Lauson & Stobbart, High-row, Darlington	20 7 9

‡ Amended.

DENTON.—For erecting a new Council school to accommodate 250 children at Denton, near Gravesend, for Kent Education Committee. Mr. W. H. Robinson, Architect to the Committee:—

S. Wise	£3,898	Jones & Andrews	£3,265
T. W. Hooker	3,841	G. Gates & Sons	3,250
S. Edwards	3,800	W. H. Archer & Son	3,243
H. W. Martin	3,598	R. E. Nightingale	3,238
Brown Bros.	3,582	A. H. Fryd	3,232
Spencer, Santo, & Co., Ltd.	3,538	C. E. Skinner	3,217
T. Crossley & Son	3,416	F. Webster & Son	3,199
West Bros.	3,382	E. Bishop & Sons	3,192
A. S. Ingleton	3,382	E. Parett & Sons	3,160
J. Podger & Sons	3,358	Friday & Ling	3,150
L. Seager	3,350	A. E. Tong	3,073
Multon & Wallis	3,333	G. Baker & Son, Pelican Wharf, Strood‡	3,059
W. F. Blay, Ltd.	3,299		
F. & G. Foster	3,296		

‡ Recommended for acceptance.

DEVONPORT.—For interior decoration of St. John the Baptist Church, for the Vicar, Wardens, and Church Council. Mr. Edgar M. Leest, architect, 14, St. Aubyn-street, Deponport:—

J. F. Prowse	£363 0	Pitchet & Son, Devonport*	£204 17 0
Horris & Sons	289 10	A. J. Osborne	192 19 6
Earl & Son	224 15		

DOVERCOURT.—For the erection of detached house, for Miss Hurst, Sunnyhill Estate. Mr. H. Steward-Watling, F.S.A., architect, Kingsway House, Dovercourt, etc.:—

Fisher & Woods	£550	Mormas	£475
King	485	Youngs*	472

[Entrance gates, fencing, and terrace walls at per schedule.]

DOVERCOURT.—For the erection of a detached house, St. Michael's-road, Dovercourt. Mr. H. Steward-Watling, F.S.A., architect, Kingsway House, Dovercourt, etc.:—

Fisher & Woods	£500	Mormas*	£375
King	385		

EALING.—For alterations and additions to No. 136, Northfield-lane, West Ealing, comprising double baker's oven and flour-loft. Messrs. Hamiltons, architects and surveyors, West Ealing:—

W. Brown	£212 0	C. Groom	£157 14
C. Webb	189 0	Harrison & Co., West Ealing‡	132 18
W. Barber	159 0		
Bird & Frost	158 0		

‡ Tender accepted subject to varied specification.

FELIXSTOWE.—For detached house, Priory-road, Felixstowe. Mr. H. Steward-Watling, F.S.A., architect, Felix-chambers, Felixstowe, etc.:—

Linzell, at per schedule.

FRODSHAM.—For new house, Lime-avenue Frodsham, for Mr. W. D. Ringrose. Mr. Samuel Davies architect, Frodsham:—

J. Littler, Frodsham* £580

IPSWICH.—For alterations and additions to premises, East-street. Mr. H. Steward-Watling, F.S.A., architect Ipswich, etc.:—

Watkins, at per schedule.

HALSTED.—For erecting an elementary school to accommodate 420 children, for Essex Education Committee (Halstead District Sub-committee). Messrs. Goodey & Cressall, architects, St. Peter's-chambers, High-street, Colchester. Quantities by Mr. J. Sydney Parmenter, Chelmsford:—

A. J. Suckling	£6,482	Kerridge & Shaw	£4,998
E. Saunders	5,910	H. Smith	4,997
Dowsing & Davies	5,500	H. J. Linzell	4,997
G. Grimwood & Sons	5,497	G. Sharp	4,988
Z. Rogers	5,284	H. Everitt & Son	4,978
W. Bell & Sons	5,216	G. Dobson & Son	4,958
Rueben Shanks	5,175	Clark & Sons	4,945
W. C. Theobald	5,115	A. H. Fryd	4,857
F. & A. Willmott	5,091	Spencer, Santo, & Co., Ltd.	4,750
S. A. Kenny	5,085	Pudney & Son	4,728
J. S. Hammond & Sons	5,081	Mason & Son	4,675
A. E. Farr	5,068	H. Potter & Son, Chelmsford‡	4,647
T. Parkington & Son	5,000		

‡ Recommended for acceptance.

KETTON.—For lych-gate, etc. Messrs. Traylen & Son, architects and surveyors, 16, Broad-street, Stamford:—

Bowman & Sons	£301 10	Willmott & Sons	£235 0
Thompson & Co.	296 0	J. W. Rouse	233 8
Bell & Sons	261 0	E. Hibbins, Ketton*	233 0
J. W. Hilliam	259 14	W. Freeman	200 12
Rudd & Son	256 10	A. S. Roberts	194 6
S. F. Halliday	237 6		
J. Woolston	237 0		

KINSON (Dorset).—For building a brick bridge at Millhams Ford, for Poole Rural District Council. Mr. R. T. S. Seymour, District Surveyor, Wimborne, Minster:—

R. Elcock	£580 10 0	J. Lawford, Upper Parkstone*	£431 2 3
J. Smith	465 0 0		
H. Tryhorn	458 0 0		

LONDON, S.W.—For decorations, etc., at No. 9, Suffolk-street, Pall Mall. Mr. Frank C. Spiller, architect and surveyor, 82, Westbourne-park-villas, Bayswater, W.:—

J. S. Henry, Ltd.	£304 0	A. Moore & Co., Paddington*	£204 15 6
Hampton & Sons	297 0		
R. Coles & Son	229 18		

LONDON.—For painting, repairs to guttering, pointing of brickwork, and other work at their Workhouse and Infirmary, for the Guardians of St. Leonard, Shoreditch. Mr. F. J. Smith, F.R.I.B.A., Parliament-mansions, Victoria-street, S.W.:—

C. & D. E. Dearing & Son, Clarence-lane, Islington £1,279

OULTON BROAD.—For the erection of two week-end cottages, Garden Estate, Oulton Broad. Mr. H. Steward-Watling, F.S.A., architect, Lowestoft, and at Elmhurst, Oulton Broad, etc.:—

Meech* £450

POLLESBURY.—For the erection of mews, stabling, load houses, and store. Mr. H. Steward-Watling, F.S.A., architect, 153A, High-street, Colchester, etc.:—

Osborne, at per schedule.

ROMFORD.—For painting buildings at the Isolation Hospital, Rush Green, for the Joint Hospital Board:—

F. J. Dulley	£87 10 0	Sharpington & Co.	£59 0 0
C. R. Walton	84 17 0	Dean & Sons	58 10 0
J. Stokes & Sons	83 5 5	Woollaston & Co.	57 0 0
J. Hocking	79 0 0	General Building Co.	55 0 0
Dowsing & Davis	78 15 0	E. H. & G. Hilliard	54 10 3
A. C. Westgate	76 0 0	E. Carter	53 14 0
G. A. Rowley	74 5 6	B. Richards	53 10 0
J. S. Hammond & Sons	74 0 0	W. L. Robison	53 10 0
J. Newlin	72 15 0	S. Squire	52 9 2
W. F. Guppy	70 10 0	Bane & Bulley	48 10 0
P. R. King	67 0 0	J. J. Richards, Brixton*	47 0 0
E. G. Bratchell	65 14 6		
Partridge Bros.	65 10 0		

SOUTHEND-ON-SEA.—For erecting a new school, Bournemouth Park-road Council School, for the Education Committee. Mr. P. Brockbank, Architect, County-chambers, Weston-road, Southend-on-Sea. Quantities by Mr. G. T. G. Wright, York-road:—

E. Leaney	£6,550 0	S. E. Moss & Co.	£5,447 8 9
W. Houghton	6,389 0	Brown Bros.	5,397 0 0
W. J. Ballard & Co.	6,199 0	J. S. Hammond & Son	5,358 0 0
J. C. Flaxman	5,997 0	F. E. Whur	5,354 0 0
F. E. Woodhams	5,899 0	W. E. Davey	5,321 0 0
A. R. Whur	5,897 0	H. W. Grainger, Southend-on-Sea*	5,184 10 0
F. & E. Davey, Ltd.	5,877 0		
E. & B. H. Davey	5,832 0		
F. Davey	5,543 0		

SOUTHEND-ON-SEA.—For alterations and additions to the boys' and girls' departments of the Southchurch Hall Council School, for the Education Committee. Messrs. Burles & Harris, Architects, Clarence-street:—

H. W. Grainger	£765	F. & E. Davey, Ltd.	£640
H. R. Wilkinson	713	S. E. Moss & Co.	620
F. E. Whur	680	J. C. Flaxman, Southchurch-road*	600
F. Davey	644		

SOUTH NORMANTON.—For taking up an old brick culvert and building a new one of concrete tubes, for the Blackwell Rural District Council. Mr. H. Silcock, Surveyor, 67, Westgate, Mansfield:—

C. Fulcher	£92 0	Lane, Bros., Hermitage Works, Mansfield*	£48 15
C. E. Cox & Co.	59 6		
H. Ashley	58 10		

STONE.—For Stallington-lane sewerage, Blythe Bridge, for the Rural District Council. Mr. J. J. Chapman, surveyor, Stone:—

J. Taylor & Son, Basford, Stoke-on-Trent‡ £221 5 8

‡ £20 additional if certain pipes are 9-in. instead of 6-in.

TAUNTON.—For rebuilding the King's Arms, North Town, for Messrs. Starkey, Knight, & Co., Ltd. Mr. G. C. Strawbridge, architect, 25, Alma-street, Taunton:—

Gleed Bros.	£1,279 0 0	Vickery Bros.	£849 17 6
F. W. Henderson	1,191 9 8	Moggridge & Sons	849 15 0
B. Way	995 5 0	J. Maddock, Taunton*	849 0 0
F. Small	933 0 0		

WANDSWORTH.—For extension of heating apparatus at the hall of Tooting Home, Church-lane, Tooting, for the Guardians:—

Vaughan Engineering Installations, Ltd.	£232 0 0
Farringdon Works & H. Pontifex & Sons, Ltd.	209 10 0
Kennington Engineering Works	180 0 0
Heating and Engineering Co.	172 10 0
L. Norden	164 0 0
W. J. Fryer & Co.	158 10 0
H. & C. Davis & Co., Ltd.	148 7 0
Russell & Co.	145 0 0
W. Tucker & Co.	144 2 6
Tilley Bros.	144 0 0
F. H. Belben & Co.	143 10 6
J. & F. May	138 10 0
C. G. Reed & Sons, Ltd.	137 12 0
Moorwood, Sons, & Co., Ltd.	134 0 0
Wenham & Waters, Ltd.	133 0 0
H. G. Power & Son	132 10 0
F. A. Norris & Co.	132 10 0
Comyn Ching & Co., Ltd.	132 0 0
Z. D. Berry & Sons	130 0 0
C. F. H. Nightingale & Co.	124 15 0
General Iron Foundry Co., Ltd., 43, Upper Thames-street, London*	122 0 0

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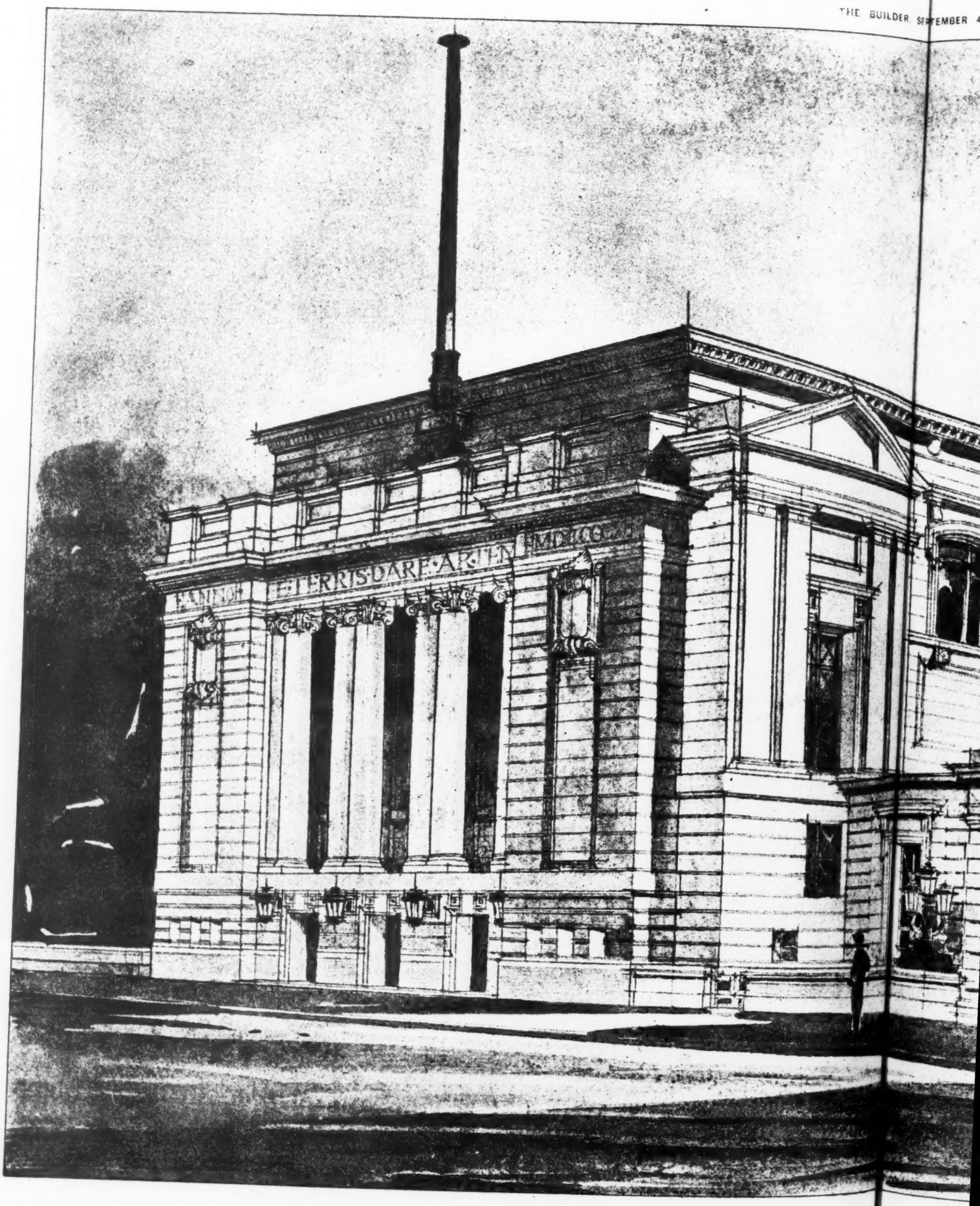

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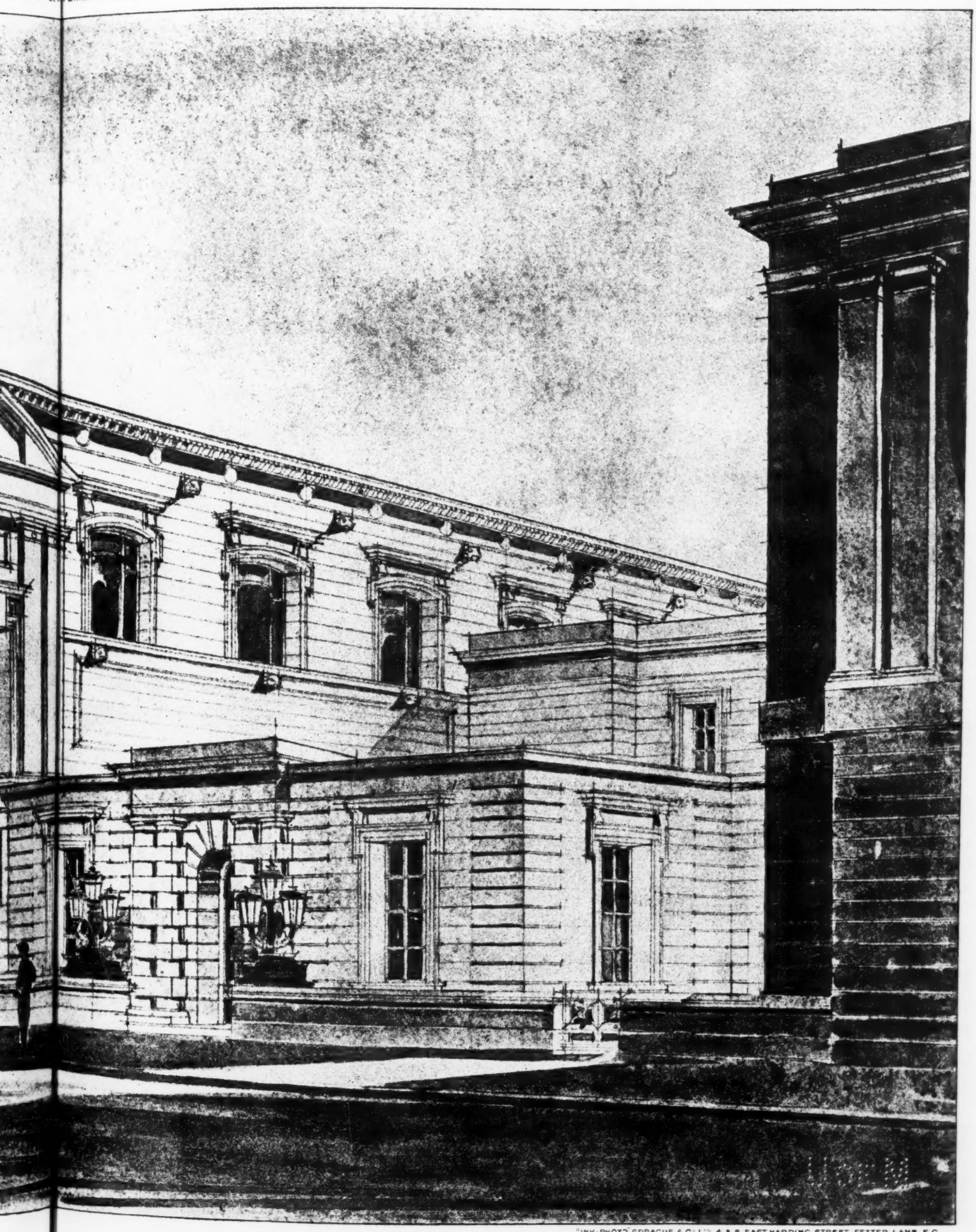

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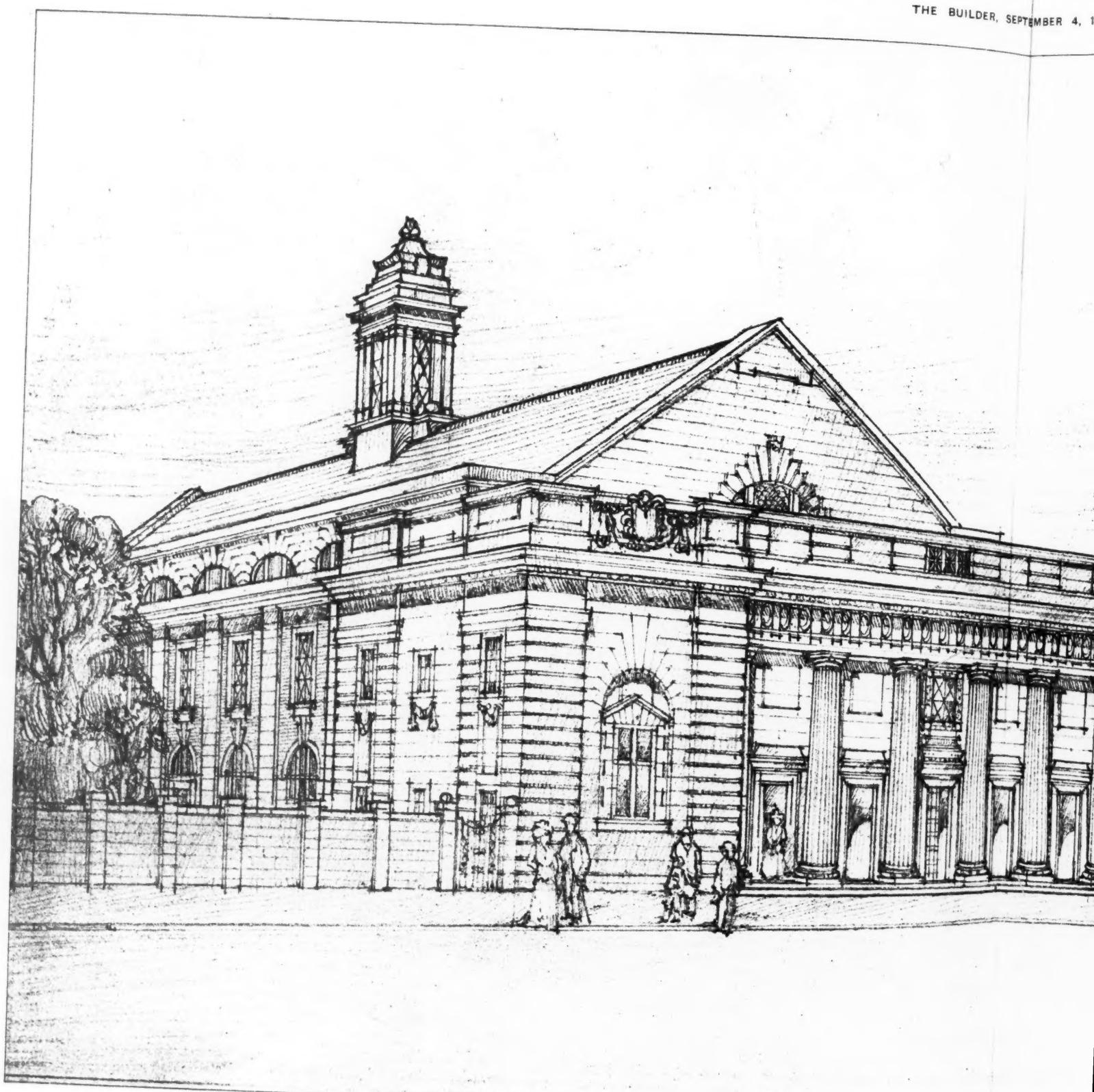

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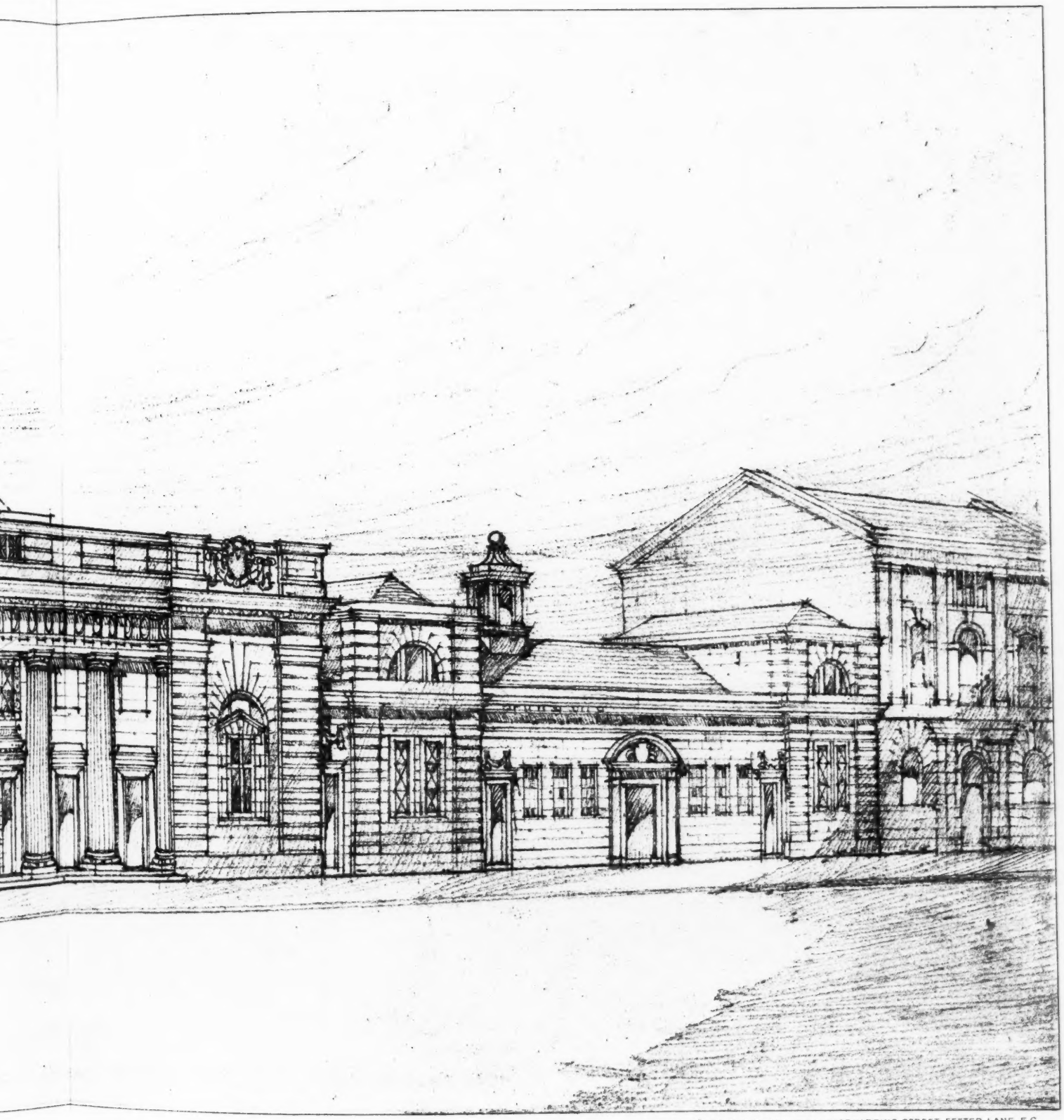

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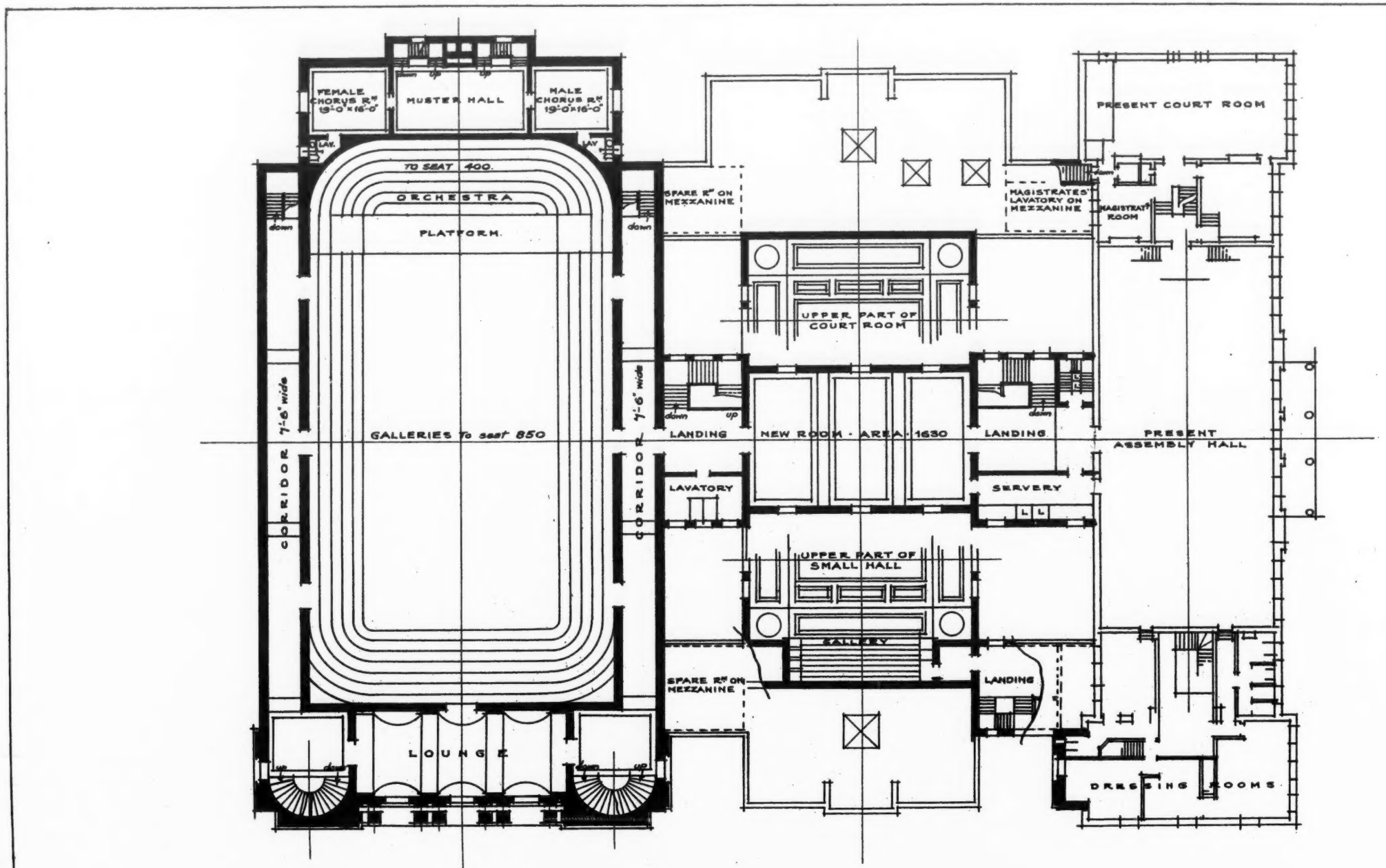

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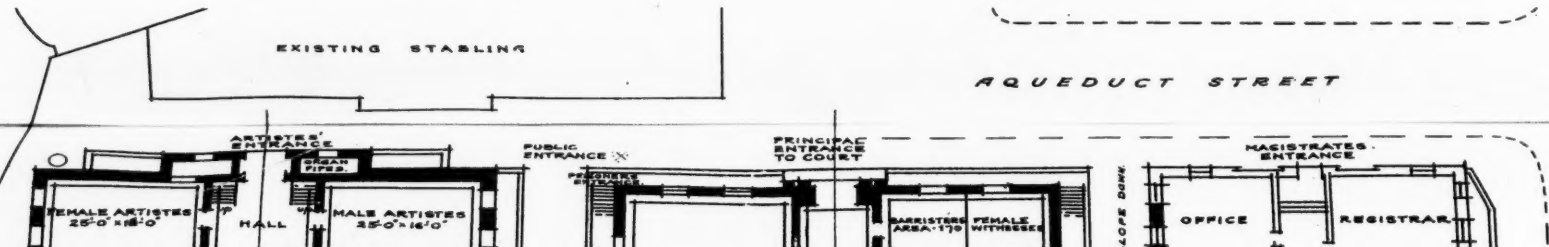

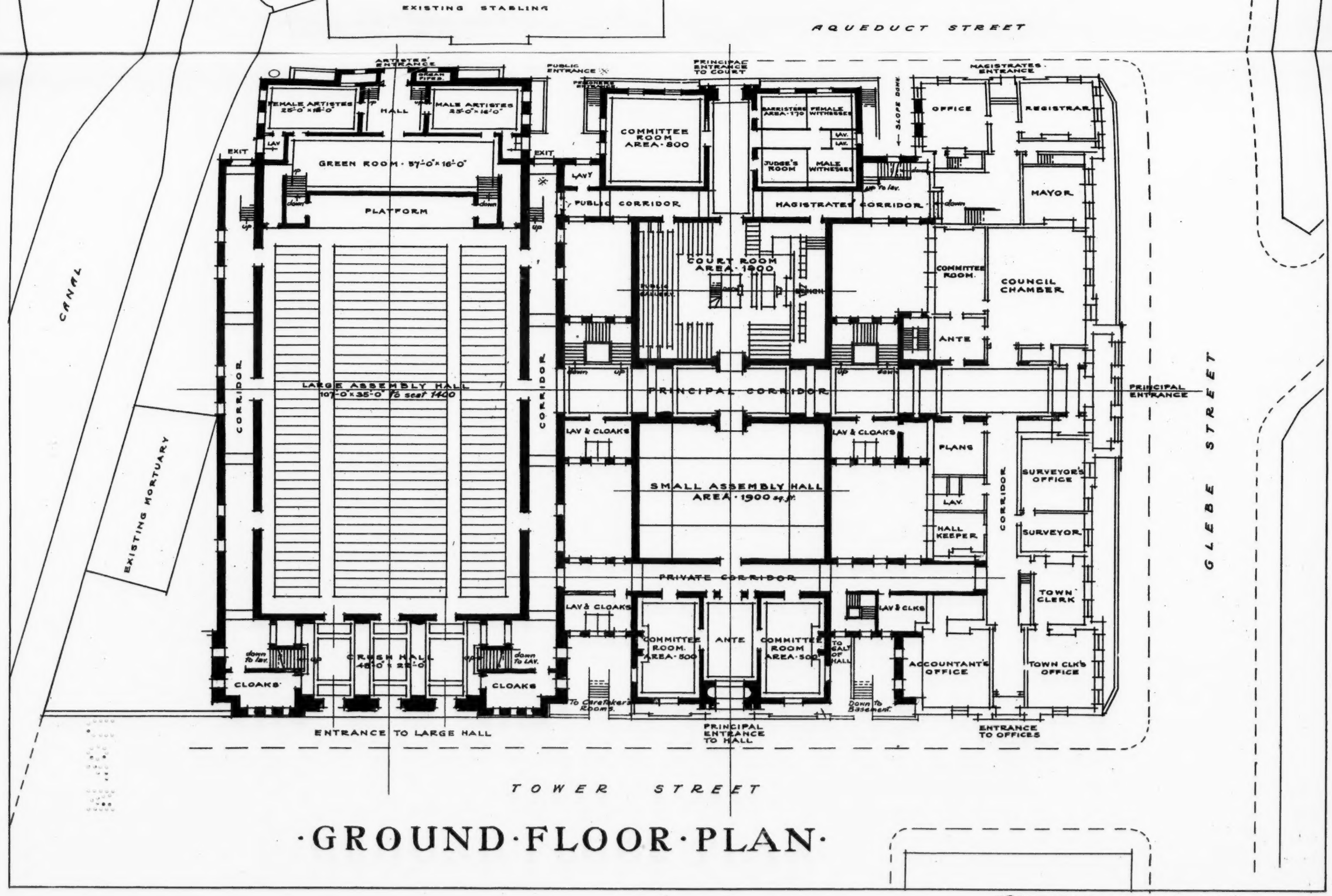

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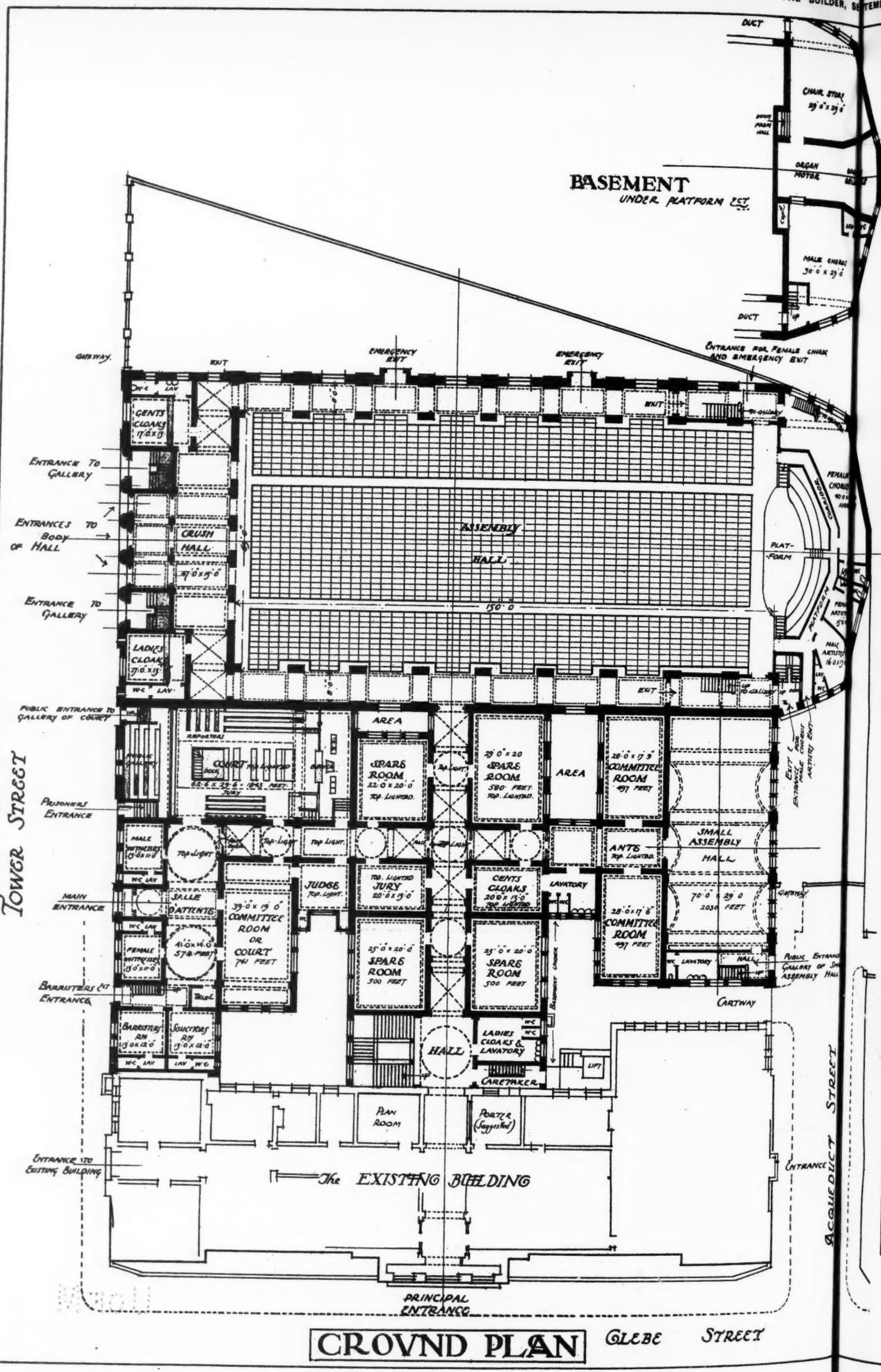

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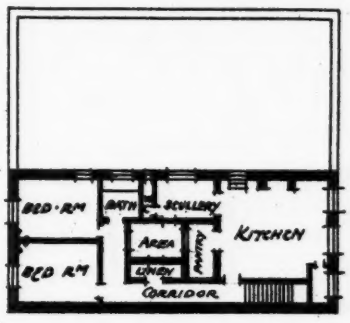

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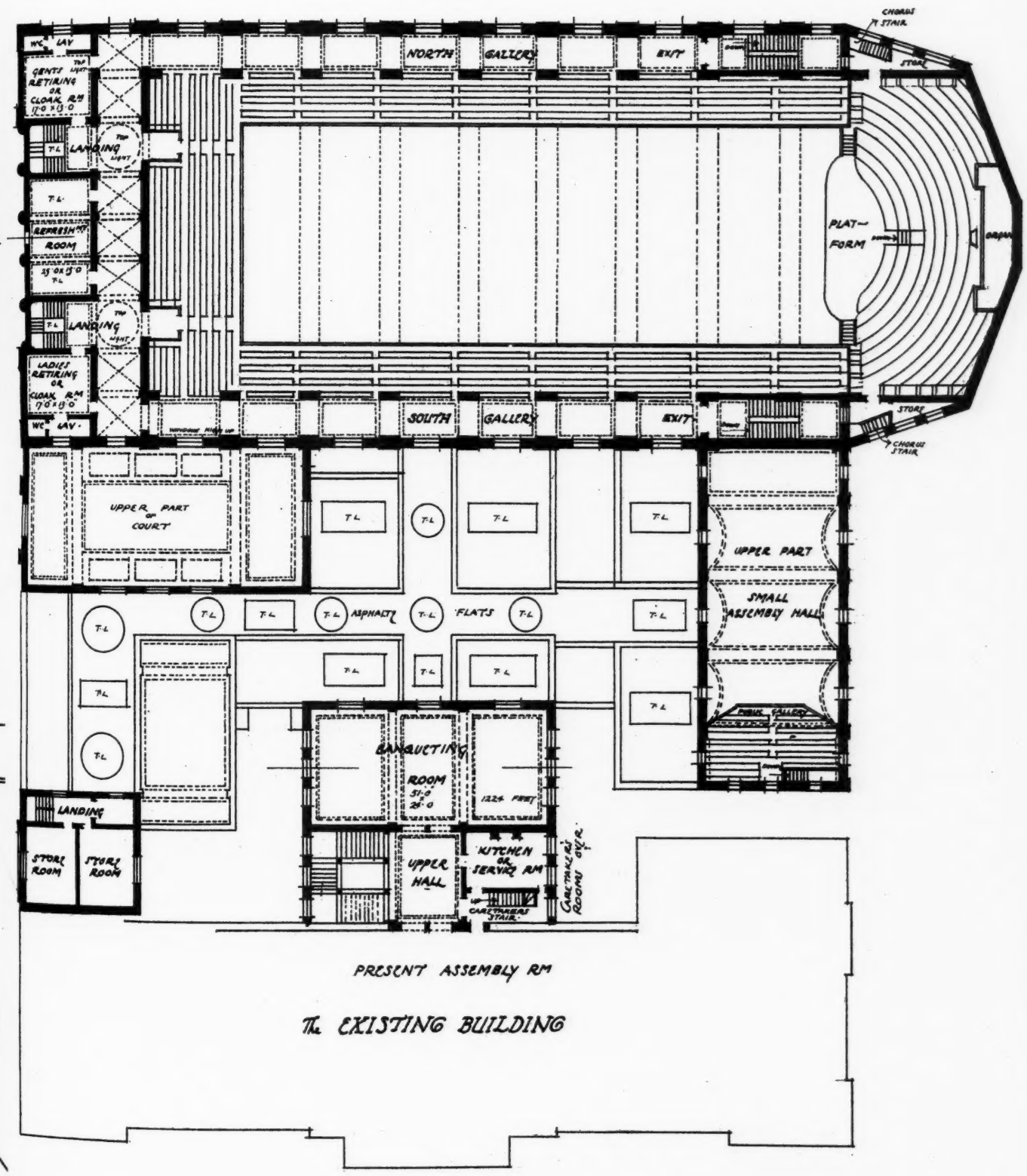

FIRST FLOOR PLAN

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